ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIX. No. 3581. JULY 12, 1946 9d. WEEKLY

High-Voltage Cables

Circumstances Favouring Their Use

ALTHOUGH economic considerations as far as they are now foreseeable will continue to require the erection of overhead lines for conveying large blocks of power for distances of any great magnitude, there should be progressively increasing scope for a.c. cables designed to operate at very high voltages. Already in a number of instances they form essential links in the 132-kV and 66-kV sections of the grid and, when conditions warrant a doubling of the former voltage, our information is that the requisite cables will be available.

Expediency and Economics

A circumstance favouring cable development is that, with the growing difficulty of securing technically suitable power station sites and the trend to locate them away from centres of population, difficulties are likely to arise in transmitting the station outputs overhead all the way into industrial areas. For this purpose high voltages will become increasingly necessary, even where they may appear unwarranted on *prima facie* economic grounds, since the physical dimensions of the space available in congested subsoils often restricts the number of cables that can be accommodated, apart from the heating effect of their mass grouping.

In such situations three-core construction appears to offer advantages over three single cables, though comparative merits in other respects are open to debate. A further factor, the importance of which is, however, often exaggerated, is the influence of a greater volume of air traffic in raising objections to the adoption of overhead lines along some routes.

The maxim that enjoins the choosing of the higher voltage when in doubt has received material backing from cable makers right from the time, more than half a century ago, when the first high-voltage cable was laid from Deptford to London. The serenity of the subsequent years of evolutionary improvement with experience was rudely disturbed by the incursion of electronics into operating phenomena when more than 22 kV was in question. The problem was quickly solved for 33 kV, while for 66 kV and above the oil-filled cable came to the rescue. So sound was the latter in the general features of its design that no major improvements have been called for in the last twenty years. Nevertheless the success of one type did not prevent manufacturers in wholesome emulation from working out a number of competitive designs, in which gas under pressure was used for eliminating ionization in voids in the dielectric.

Proved in Service

Three main types have survived. Their designs were completed about ten years ago and they have now been proved in operation on commercial load, before and during the war. The principles of their construction, which were described by Dr. P. Dunsheath and Mr. C. H. Jolin appropriately at the International Conference in Paris, are summarised in this issue, and Dr. L. G. Brazier's account on the same occasion of the cable used in a particular installation was reported by us

last week. A large proportion of these papers was devoted to accessories and joints, which with further operating experience will no doubt be simplified and reduced in number. Heavy expenditure on research and development charges are presumably reflected in the present price of these cables, which may be expected to be lowered with their more extensive use. The practicability of that will depend also on finding satisfactory solutions of problems connected with voltage regulation and capacity currents.

Consumers' Choice

AT the I.M.E.A. Convention, Mr. Shinwell, although stressing the Government's intention to "co-ordinate" the fuel industries, suggested that consumers would still be free to decide whether they would use gas or electricity. This freedom of choice is confirmed in a circular issued to local authorities by the Minister of Health after consultation with the Minister of Fuel and Power. The circular aims at preventing the authorities from stipulating that housing estates shall be either "all-gas" or "all-electric," which is said to be prejudicial to the co-ordinated development of both industries and deprives the consumer of freedom of choice. In deciding what proportions of houses on an estate shall be equipped for gas or electricity the authority is expected to consult both gas and electricity undertakings.

What is Wrong?

A distressing situation in the electrical contracting industry was referred to by Mr. R. H. M. Drake at the annual meeting of the Electrical Contractors' Association last week. He said that while hourly rates of pay had risen by nearly 50 per cent output had dropped by 40 per cent, resulting in an increase in labour costs for any particular job of 150 per cent. This was a strong statement but no doubt made with the full responsibility which one would expect from the head of an organization of the E.C.A.'s standing. This aspect of the cost of providing electricity is seldom regarded in discussions on the cheapening of supply to the consumer ; generally the onus is put upon the supply authority or sometimes upon the manufacturer of appliances. Not only the contracting industry is affected in this way and not all of the trouble can be attributed to post-war malaise. If the reason could be discovered remedies could be applied.

Coal Reserves

BY the publication of the Rapid Survey of Coal Reserves and Production by the Fuel Research Board (Stationery Office 9d. net), comprehensive data becomes available for the first time that relates the quality of coal required for specific purposes to the quantity of the resources developed in each case. No other country, it is claimed, has such complete information. The survey is in the nature of an interim report and a long-term study is to be issued later. It covers 20,000 million tons expected to be mined between 1942 and 2042. It seems evident that for the next century, at any rate, there are no grounds for pessimism.

Fuel Types

FORTUNATELY high-volatile general-utility bituminous coal forms a very large proportion of the nation's reserves. Analysis of the outputs of the collieries projected for 1942 to 1952 shows that while the amount of coking coals used each year represents a greater proportion of the total annual output than it does of the total developed reserves, the medium and weakly caking varieties, such as are suitable for power stations, leave an appreciable margin the other way, which is available for more extensive production of electricity. In addition there is, of course, the field presented to low-volatile coal by its use in pulverized form in power stations.

Shorter Working Week

THE decision of the A.E.U. to continue to press for a forty-hour week, probably by stages, lends interest to a report in the *Electrical Trades Journal*. This says that before the war a 42½-hour week, with 47 hours' pay, was operated at the Guiseley works of Crompton Parkinson, Ltd. During the war hours were raised to 47 a week, but now the company has agreed to reduce these to 44, with the same pay, and the hope is expressed that production will warrant an eventual reversion to 42½ hours. The Horstmann Gear Co., Ltd., has adopted a 40-hour week and expects this to ensure good workmanship and increased production.

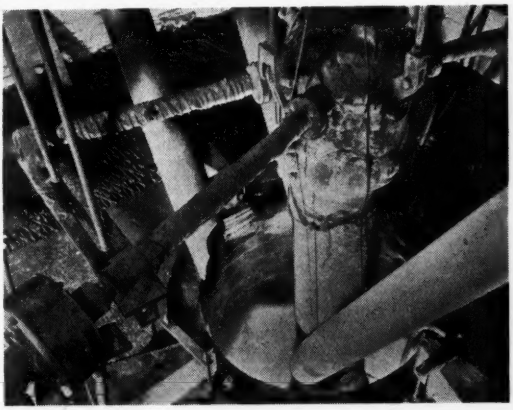
Very Large Furnaces

Producing Calcium Carbide

IN this article we propose to describe what we believe to be the largest electric furnaces made and operated in this country, at any rate so far as electrical loading is concerned. They are installed at the factory of British Industrial Solvents, Ltd., near Port Talbot, for the large-scale production of calcium carbide which was outlined in the *Electrical Review* of June 7th. Each of the three furnaces has a nominal rating of 15,000 kW, which provides for an output of about 100 tons of carbide per day. Each furnace employs Soderberg self-baking type electrodes 45 inches in diameter, supplied at about 140 V, three-phase, with a delta connection directly at the electrodes which are spaced at 102-in. centres.

Each furnace employs Soderberg self-baking type electrodes. This picture was taken looking up into a furnace not in use

At their lower ends the electrodes are immersed in the mixture of coke and lime which makes up the furnace charge, and they extend vertically above the surface of the charge to a total height of about 40 ft, through two working floors on which are located the suspension, slipping and electrode paste tamping equipments to be referred to later. The furnace shell containing the reaction mixture is an irregular six-sided structure with its sides inclined outwards from the bottom, so as to afford a measure of protection against the effects of horizontal expansion of the furnace contents during operation. At the back the longest wall is about 28 ft long and at the front the shortest wall, which contains the tapping hole, is about 10 ft long. The furnace shell is refractory lined, the tapping hole wall being about 22 in. thick and the other side walls about 13 in. thick. The bottom of the shell is covered with 6 in. of refractory and a 4 to 5 ft bed of tamped anthracite coal which forms a conducting bottom after it has been graphitized by the heat of the furnace. The total height of the shell is about 13 ft, the top 7 or 8 ft being filled with the reaction mixture in which the electrodes are immersed.

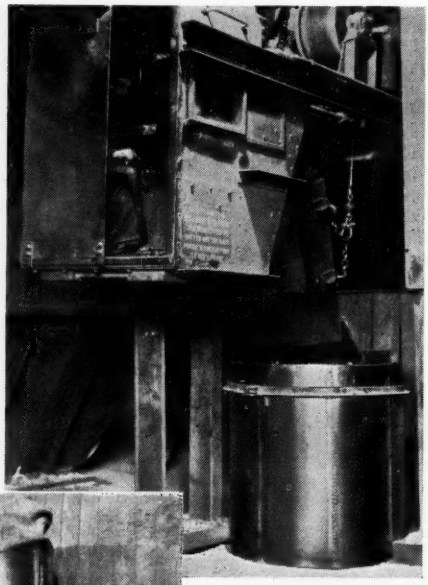


Anthracite is fed into the top of the calcining furnace by four feed spouts

An essential auxiliary to the carbide furnace installation is the plant employed in

making the paste with which the continuous self-baking electrodes are supplied. The main constituent of this paste is anthracite coal which is sucked up directly from the railway wagons by a vacuum pump into bunkers at the top of the calcining furnace section of the paste-making plant. From the "raw" anthracite bunkers the coal is fed down to flood the top of a calcining furnace.

This is essentially a refractory-lined vertical cylindrical steel shell into which 18-inch dia. amorphous carbon electrodes are introduced at top and bottom. The bottom of the furnace cylinder is sealed, except for a small annular space, by means of a water-cooled circular plate through which the bottom electrode of the furnace passes.



The electrode paste is crane fed into the cylindrical casing

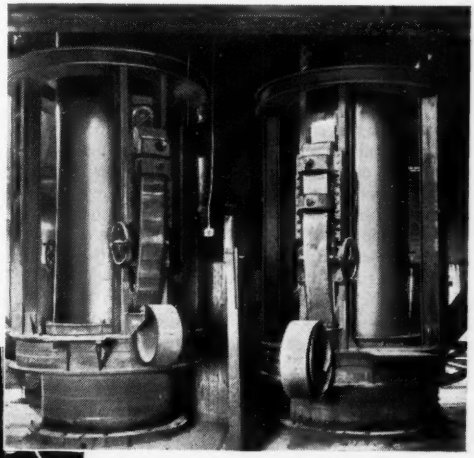
In operation, a single-phase current of the order of 5,000 A at 75 V is passed through the anthracite coal which fills the furnace and which, in passing down through the furnace, is progressively made more conducting. Calcined coal is continuously discharged from the furnace by a series of scrapers which travel around the edge of the bottom plate and are carried on a circular rack concentrically arranged with the furnace body. As calcined coal is removed at the bottom raw coal is automatically fed in at the top. The rate of discharge is regulated so as to maintain the furnace current constant. The calcined anthracite is swept by the discharge paddles into a trough around the bottom plate from which it is chute fed into a water-cooled screw conveyor. This supplies an elevator which feeds a vibrating screen from which coarse and medium sized fractions are conveyed by separate screw conveyors to storage bunkers.

The electrode material is contained in a cylindrical sheet-steel casing which is built up in sections by welding

From these bunkers some of the anthracite is passed to a Hardinge ball mill for the production of fines which are pneumatically conveyed to a ground-fines bunker. The paste is made up into 1,400-lb batches with the following proportioning of the ingredients: coarse anthracite 560 lb, medium anthracite 140 lb, ground fines 420 lb, and tar and pitch bond 280 lb. The ingredients are mixed in an oil jacketed paddle mixer. The oil, which is continuously circulated, is electrically heated to about 140 deg C. From the mixer the paste is discharged into trays for delivery to the furnace building by means of a telpher crane. If the paste is not immediately

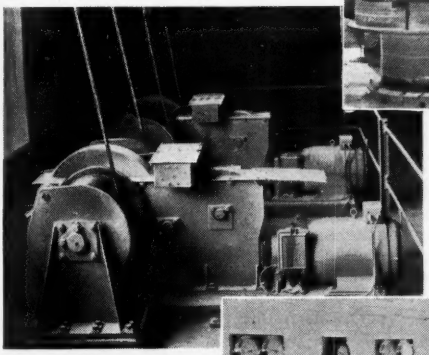
required on its arrival on the tamping floor of the furnace building it is deposited in electrically heated ovens which maintain the temperature of the paste at 125 deg C, until it is actually needed for the purpose of building up the electrodes.

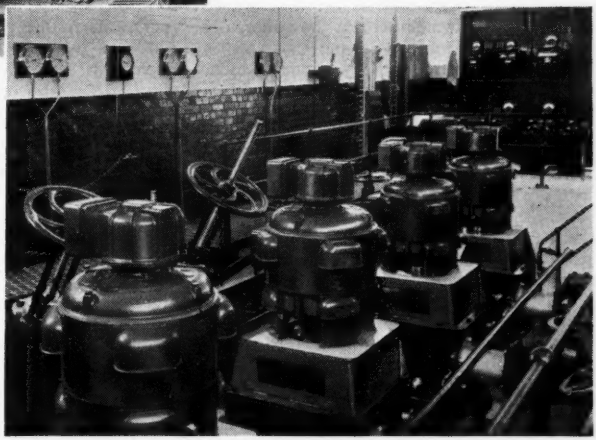
Except for the ends which are actually immersed in the furnace charge the carbide furnace electrodes consist of a cylindrical sheet-steel casing filled with unbaked and semi-baked paste. As the electrode is lowered to compensate for consumption at the furnace end additional sections of casing are welded on at the top. Each section is about 4 ft long and when it has been welded in position paste is filled into it from the trays previously mentioned. At the furnace end of the electrodes the paste is baked hard by the heat of the furnace and the outer steel casing is melted away. The electrode assembly includes a dust shield arranged around the electrode, with an annular space of about 4 in. between the electrode and the shield. In addition to providing the means of support for the electrode the dust shield also protects the electrode from the contact-fouling effects of the dust and fumes inside the furnace hood. This protection is increased by blowing air down the space between electrode and shield.



Further support for the electrodes is provided by means of "Wisdom" equipment

The complete electrode assembly weighs about 30 tons. Rope sheaves, through which pass wire ropes from the electrode winches, are secured to the top of the dust shields which at their lower ends carry lugs from which, by means of insulated links, contact shoes are suspended. These shoes are





Above: Rope sheaves from raising and lowering winches are secured to the top of the dust shield Right: Water is required for cooling the furnace connections to the extent of about 150,000 gallons per hour; one of the pump houses

forced into electrical and mechanical contact with the electrode by means of set bolts which pass through heavy cast-steel water-cooled rings which surround each electrode. Further support for the electrodes is provided by "Wisdom" ribbons which consist essentially of steel ribbons attached to the electrodes and to the dust shields. On each electrode two 9 in. ribbons on opposite sides of the electrode are welded at intervals to the electrode casing. After passing over a series of friction drums fitted to the suspension cradle at the top of the dust shield each ribbon is held first by a fixed vice and then by a vice which is movable by means of a captive screw passing through the body of the vice. When it is required to lower the electrode independently of the dust shield the ribbons are released at the fixed vice and the movable vice is moved in the proper direction by rotating its operating screw. When the required electrode movement has been completed the ribbon is again secured at the fixed vice and then released at the movable vice which is run back to its initial position and again tightened to clamp the ribbon.

Load Control System

The method of furnace load control for moment-to-moment purposes involves the regulation of the electrode currents by varying the degree of immersion of the electrodes in the charge. The whole electrode assembly is raised or lowered either manually by the operation of push buttons on the furnace control panels, which actuate the contactors controlling the motors driving the winches by which the electrodes are raised or lowered, or automatically by the use of current sensitive relays which also actuate the contactors. Normally the automatic control system is used for running conditions and hand control reserved for starting up. Major changes of load are effected by altering the electrode-to-electrode voltage. Such changes, however, are infrequent and they are therefore dealt with by off-load tap changing at the furnace transformers.

Each furnace is supplied by a bank of three 10,120-kVA 33-kV 220-V single-phase transformers, the bank being connected delta-delta. These transformers will be dealt with more fully in a later article describing the works' unusual distribution system. The low-voltage connections from the transformers to the points near the furnace where the connections to the electrodes are made, take the form of interleaved stacks of 12-in. by 5/16-in. copper busbars. The busbar stack from each transformer is composed of 32 bars arranged in 16 rows of two bars each. Eight of these rows are of one polarity and eight of the opposite polarity, that is to say, the current in any row is 180 deg. out of phase with the current flowing in the next row. At the furnace end of the interleaved stacks, in order to reduce the number of connections to the electrodes, each nearest pair of bars of the same polarity, i.e., one and three, five and seven, etc., and two and four, six and eight, etc., are connected in parallel and to horizontal water-cooled copper pipes which pass through the "Everdur" water-cooled panel assembly which surrounds the furnace at the stoking-floor level. Thus each busbar stack terminates in eight horizontal conductor pipes, four of one polarity and four of the other.

Each electrode is fitted with eight contact shoes to which are attached short vertical copper pipes. The horizontal conductor pipes are fixed while the contact shoes and vertical conductor pipes move up and down with the electrodes. To carry the electrode current and cooling water over the furnace top and at the same time to allow electrode movement, the horizontal conductor pipes connected to the busbars and the vertical conductor pipes connected to the contact shoes are joined by water-cooled flexible cables.

Each of the electrodes is connected by four flexible cables to the busbar stacks from two transformers, the currents in the two sets of four cables under balanced conditions being 120 deg. out of phase with one another. Each cable assembly consists essentially of a stranded flexible copper conductor layed up around a tightly wound helix of copper wire to give a hollow core, and an outer casing of corrugated seamless copper alloy tubing.

Cooling Arrangements

The central conductor and the outer casing are connected into flanged end castings fitted with ports to allow water to flow through the core of the central conductor and between it and the outer casing. The cross sectional area of the stranded conductor is approximately 1·2 sq in. and is loaded at a current density of about 10,000 A per sq in.

Cooling water is introduced through rubber-insulated connections to the ends of alternate horizontal conductor pipes and passes through them to the water-cooled flexible cables, through the vertical conductor pipes and contact shoes, across to the

adjacent contact shoe by a short flexible pipe and so back to the end of the horizontal conductor pipe next to that at which it entered. The cooling water requirements of the furnace connections are about 100,000 gallons per hour and are supplied from the factory's water-cooling installation. This system provides for the recirculation of up to 250,000 gallons per hour through two spray cooling ponds. Make-up water is obtained from wells on the factory site. Emergency water supply and pressure stabilization is effected by means of a water tower having a capacity of 100,000 gallons, on the high-pressure main.

Our thanks are due to Mr. F. Newport, works manager, British Industrial Solvents, Ltd., for permission to visit the factory, and to Mr. W. F. Archibald, chief engineer, and Mr. T. A. Felton, assistant electrical engineer, for their help in obtaining information and taking photographs.

Fan Makers' Meeting

Proposed Code of Practice : Export Trade

THE second annual meeting of the Fan and Allied Manufacturers' Association was held at the Connaught Rooms, London, on July 4th. In presenting his annual report at a luncheon preceding the meeting, the chairman (Mr. M. Geoffrey Woods) said that there had been no alteration in membership during the past year. Members were being asked for their views on the value of a code of practice for the industry. If such a code were adopted adherence to it would probably be a condition of membership.

The Council had approached the Statistical Department of the Board of Trade in an endeavour to secure separate entries for fans in the trade returns. As a result the Department had agreed to do this for exports, and enter them under the headings " desk and ceiling fans " and " other fans." It was not possible to secure a similar segregation in the case of imports. In this connection Mr. Woods said that he had felt that British fan manufacturers were not yet contributing their full quota to export trade. They should seize the present opportunities in preparation for the fight for trade which would set in in four or five years' time.

The Export Promotion Department of the Board of Trade had assured the Council that 75 per cent of the copies of the F.A.M.A. export brochure had already been sent abroad and the balance was going shortly. Copies of the brochure had been sent to over 700 users of fans on a large scale. After much delay and protracted discussions the Council had decided that no useful purpose would be served by sending a " team " of members to Germany to inspect the German fan industry.

Mr. Woods said that it was proposed to ascertain members' views on the subject of the Engineering and Marine Exhibition which was to be held next year: whether the Association should have a stand and whether the exhibits of members could be arranged near one another. It was hoped that some of the member firms would be represented at the exhibition being organized by the Council of Industrial Design.

Standard conditions of sale were another subject upon which members' views were being sought. If these were adopted their use might also be a condition of membership. The production of a leaflet on the future of ventilation in the home was being considered.

A member had reported hearing a broadcast news item that Japan was to be allowed to produce a limited quantity of goods for export, including 10,000 electric fans. Representations had been made by the Council through the British Government to Washington as it was considered entirely wrong that the Japanese should be allowed to compete with British makers of fans in the Middle and Far East.

The Association was participating in the work of a co-ordinating body linking associations of manufacturers of plant and machinery for use underground.

The meeting approved the proposals for the adoption of a code of practice and standard conditions of sale and Mr. Woods and the Council were re-elected.

Power Station Emissions

REPRESENTATIONS are being made by the L.C.C. to the Ministry of Fuel and Power that special arrangements should be made for the supply of suitable fuel to large undertakings such as electricity supply companies so as to avoid nuisance caused by the emission of smoke and grit. A deputation organized by the Willesden Corporation and including representatives from the Wembley, Acton and Chelsea Councils recently attended the Ministry of Health to urge the suppression of nuisance from power stations, pointing out that a great deal could be achieved by the introduction of modern methods; that smoke watchers were employed only in daylight hours and therefore black smoke could be emitted with impunity at night; and that smoke prevention machinery was already overloaded but that nevertheless further generating plant was being installed. According to a report to the Chelsea Council the Parliamentary Secretary of the Ministry was very sympathetic and promised a full and immediate inquiry and action for diverting a higher grade fuel to power stations in Chelsea and Willesden. The Parliamentary Committee of the Chelsea Council considers that the root of the trouble is the inadequacy of the grit arresting and cleansing plant.

Views on the News

Reflections on Current Topics

TO go straight from one conference to another may not seem the best form of relaxation but the case is different when one has been responsible for the organization of the first one. Therefore Mr. J. W. Simpson may have found attendance at the C.I.G.R.E. in Paris quite restful after his strenuous time at Blackpool. I am sure that none of those who attended the I.M.E.A. Convention fully appreciated what it meant to undertake the arrangement and running of an affair of this magnitude in present circumstances. It is indeed a matter for astonishment, and certainly for congratulation, that so close an approach to the very excellent pre-war standard was made in the face of such difficulties.

* * *

Service to consumers being the accepted criterion of the efficacy of a supply undertaking, engineers responsible for load development will no doubt be pleased to hear of a further aid to close acquaintanceship with the electrical habits of those who, paying the piper, will inevitably, sooner or later, call the tune. Following up its pilot study in the Enfield area of the Northmet Co., given in Technical Report K/T119 (see *Electrical Review*, May 3rd), the Electrical Research Association is to extend its sampling survey to the areas of 100 or so undertakings, including the largest ones. About 100,000 cases, representative of nearly half the total of 10 million domestic consumers in the country, will be analysed on lines similar to those of Tables 2 and 3 of the earlier Report. I can recommend careful study of the latter as an illustration of the kind of essential information to be gained from sampling methods for an individual undertaking.

* * *

The potentialities of the thermal storage electric cooker have again been brought into prominence by the appearance of the Sterling Engineering Co.'s new cooker at the recent I.M.E.A. Electrical Exhibition. This type of apparatus has never " caught on " though it has features to recommend it, especially for catering establishments and for households in which a lot of cooking is done. Though its consumption is somewhat heavier than that of the orthodox type, its loading is much lower and also constant, a point which appeals to supply undertakings. It is always immediately ready for use and there is no waiting for the oven and hot-plates to heat up. The initial cost is of course higher than that of an ordinary electric cooker, but no higher than the solid fuel cooker which in appearance and purpose it most resembles. Another type of cooker of novel design which also appears to have possibilities is the Gillott electro-steam unit which, besides performing the usual functions of cooking, also provides immediate boiling water at the rate of 3 pints every two minutes and approximately 22 gallons of hot water at 160 deg F for baths and other domestic uses.

* * *

A few days ago I asked a representative of a well-known radio manufacturer how his industry was progressing with its task of meeting the pent-up demands for his products. To my surprise he replied that, although there was still much lee-way to be made up and receivers would still be scarce for a while, apparently the market is not so extensive as had been thought in the first place. The life of a radio set is much longer than originally estimated and, as there have not been any revolutionary developments during the war to make their apparatus obsolete, most listeners are content to carry on with the sets that are still giving reasonably good service, having in mind perhaps the purchase of television receivers a little later when increased production permits the lowering of prices.

* * *

Two or three weeks ago I referred to the reluctance of Bury Corporation to offer the Walker scale salary for the post of chief electrical engineer rendered vacant by the retirement of Mr. J. G. Potts. The matter has been debated *ad nauseam* by the Electricity Committee and the Council but now, in spite of its lack of success two months ago, the Council is sticking to its guns and is to re-advertise the position at the same salary—£1,000 rising to £1,100, against the scale figures of £1,208–£1,422.

* * *

In the July *Electrical Contractor* " Pilgrim Three " mentions a case of " priority " carried to extremes. His firm ordered a 200-A switch-fuse but the manufacturer concerned said they could not have it without quoting a priority symbol. The firm pointed out that the priority scheme was intended to conserve supplies for housing purposes and asked what sort of a house was likely to need a 200-A switch-fuse. The manufacturer saw the point and delivered the goods without further argument. It seems that it is not only civil servants who make a fetish of the blessed word " priority."—**REFLECTOR.**

Variable-Speed Motors

Operating Drives up to 24,000 r.p.m.

By "Rotor"

ONE disadvantage of the simple squirrel-cage motor is that, when fed from a supply of given frequency, the motor speed depends entirely on the load, normally varying from very slightly below synchronous speed to about 95 per cent of synchronous speed. For certain drives, such as woodworking planers, spindle moulders and routers, high cutter speeds are required, in some cases as much as 24,000 r.p.m. A plain squirrel-cage 50-cycle motor having a maximum speed of 3,000 r.p.m. cannot be used for the direct drive of such tools.

Specially designed squirrel-cage motors supplied from a source of high-frequency A.C. are often coupled to the cutter spindles on such drives. For small-power high-frequency supplies an induction frequency changer, which may form part of the individual machine tool, is commonly used. This comprises a slip-ring or squirrel-cage induction motor running at mains frequency direct-coupled to a slip-ring motor wound for a large number of poles. The stator of the latter machine is supplied with A.C. from the mains, which creates a magnetic field of practically constant strength rotating at synchronous frequency with respect to the fixed stator. If the rotor were driven at the same speed as the revolving magnetic field and in the same direction the magnetic field would not cut across the rotor conductors, so that no voltage would be generated in the rotor windings. When the rotor is stationary the field crosses the rotor windings at synchronous speed and generates a voltage of synchronous frequency in them, the motor then acting as a transformer. When the rotor is driven in the opposite direction to the revolving field current at a higher voltage and frequency is generated in the rotor windings and brought out through slip rings to feed one or more h.f. induction motors.

As an example we can take a 50-cycle induction motor having two poles per phase and a synchronous speed of 3,000 r.p.m. directly coupled to the rotor of an induction generator which has its stator and rotor wound for twelve poles per phase. The magnetic field of the induction generator supplied from the 50-cycle mains will revolve at 500 r.p.m. with respect to the stator. If the rotor were held the frequency of its generated voltage would be 50 cycles per sec. With the rotor driven at 3,000 r.p.m. in the same direction as the revolving magnetic field the frequency would be 250 cycles per sec.

By means of a reversing switch the phase rotation of the stator supply can often be changed to reverse the direction of the revolving field of the generator, so the field crosses the rotor conductors at a higher speed and 350 cycles per sec. is available at the slip rings. This supply can be fed to a two-pole squirrel-cage motor arranged for operation on the two voltages, which has synchronous speeds of 15,000 and 21,000 r.p.m. The rotor speed of the frequency changer will fall slightly on load due to the slip of its driving motor, and the cutter motor will also have slip on load; fall of speed does not occur with a synchronous convertor, which gives a supply of constant frequency.

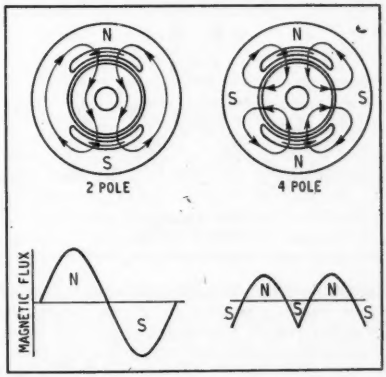


Fig. 1.—Pole changing by reversal of connections to one coil group

Double-Stator Motors

A special type of squirrel-cage motor has been designed to run at more than normal synchronous speed at mains frequency. This machine has a two-pole stator winding fed from the 50-cycle mains to create a magnetic field revolving at 3,000 r.p.m. The rotor, with the same synchronous speed, is hollow and its bore is wound as a two-pole stator

fed through slip rings. The inner stator thus creates a magnetic field revolving at 3,000 r.p.m. with respect to itself or a synchronous speed of 6,000 r.p.m. with respect to the outer stator, both fields revolving in the same direction. The inner stator acts on a squirrel-cage rotor with 50-cycle synchronous speed of 6,000 r.p.m. A pole-passing from a portion of the stator tunnel encircled by a coil group to a portion midway between the coil groups, as indicated in Fig. 1. The magnetizing current taken by each coil will, however, be greater when connected for consequent poles than for salient poles, as each coil group has to pass the magnetic flux across two air gaps. In order to be able

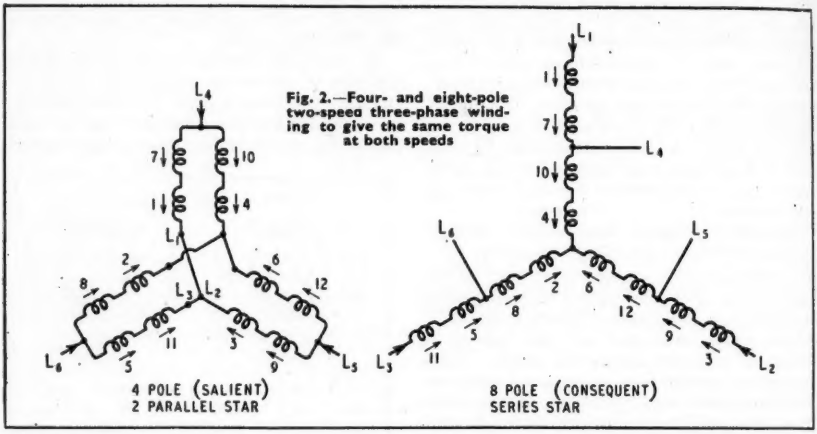


Fig. 2.—Four- and eight-pole two-speed three-phase winding to give the same torque at both speeds

changing switch may be used with the outer stator winding so that it can be connected for either two or four poles to give the rotor synchronous speeds of 6,000 and 4,500 r.p.m.

Pole Changing

The speed of all squirrel-cage induction motors can be varied below synchronous speed if the stator is wound for use with switchgear for altering the number of poles created by the stator windings. In the salient-pole stator winding there is one group of coils per pole for each phase. In a consequent-pole winding, however, each group of coils creates two poles, so there are twice as many poles as there are groups of coils. It follows that if one group of coils in a two-pole salient-pole winding is reversed the motor will have four poles, the magnetic flux to change the number of poles in this way the coil pitch should not exceed a certain amount.

An arrangement for a two-speed winding for four or eight poles which would give 50-cycle synchronous speeds of 1,500 and 750 r.p.m. is shown in Fig. 2. Six connections are brought out from the stator windings; for a four-pole salient winding the line

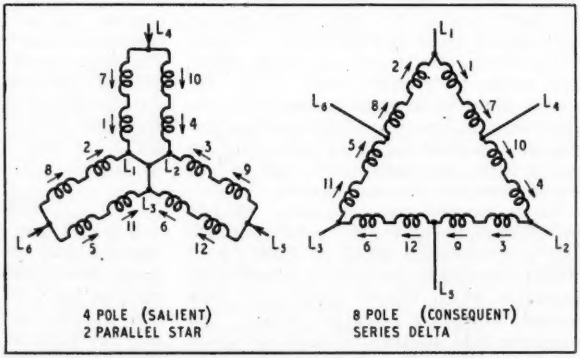


Fig. 3.—Four- and eight-pole two-speed three-phase winding to give same horse-power at both speeds

leads are connected to L_4, L_5 and L_6 and for an eight-pole consequent-pole winding to L_1, L_2 and L_3. In the four-pole connection there are half as many coil groups in series between the supply lines as there are with the eight-pole connection, so the magnetic flux per pole on four poles must be approximately twice as great as with eight poles to give the same induced stator voltage. This means that the total magnetic flux of the motor and the magnetizing current will be practically the same in both cases. The full-load torque of the motor will also be the same, and the horse-power will be proportional to the speed.

In the arrangement indicated in Fig. 3, however, the supply lines are connected to L_4, L_5 and L_6 for four poles, and to L_1, L_2 and L_3 for eight poles, the number of groups of

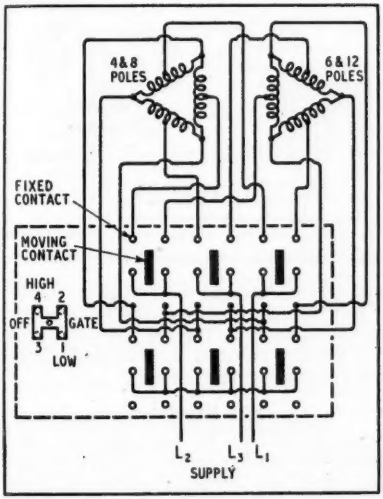


Fig. 4.—Connections for four-speed three-phase stator

coils between the supply lines being the same in each case. The magnetic flux per pole must, therefore, be approximately the same. The magnetizing current will be greater with eight poles owing to the increased length of air gap per coil group and the total flux will be doubled, as will the full-load torque to give a practically constant full-load horse-power at both speeds.

Various other arrangements of winding are possible, for example two double-speed windings can be used in a machine to give four and eight poles or six and twelve poles

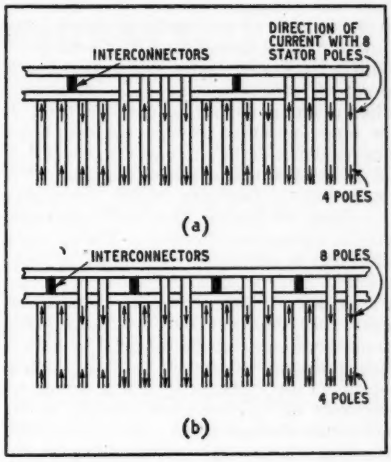


Fig. 5.— Use of resistance interconnectors to control torque of two-speed squirrel-cage rotors

with four speeds. The change-speed switch used with such a motor is a multi-contact arrangement, Fig. 4, and in view of the comparatively large number of connections required between it and the motor, it is frequently mounted on the motor case.

Squirrel-Cage Rotors for Multi-speed Motors

A squirrel-cage rotor automatically assumes the same number of poles as the stator, provided it has a sufficient number of bars. This is not the case with a wound slip-ring rotor which, if used in a multi-speed stator, must also be arranged for pole changing. The resistance of the rotor bars and end rings of a squirrel-cage motor controls the starting torque. The resistance of the rotor bars is independent of the number of poles, but the effective resistance of the end rings decreases with increased number of poles, since there is less periphery of end ring in circuit per pole and more sections are in parallel. In consequence, if the resistance of the end rings is an appreciable proportion of the total rotor resistance, the relation between the motor torque and slip may be appreciably altered by pole changing, causing starting troubles.

The arrangement of squirrel-cage rotor shown in Fig. 5 (a) may be adopted for speed changing in the ratio of 2 to 1. The rotor bars are divided into four groups, adjacent groups being connected to two sets of end rings (at either or both ends of the rotor) interconnected at equal points. With an

eight-pole stator connection the rotor virtually consists of two cages in parallel, no current passing through the interconnectors. With a four-pole stator connection, each group of rotor conductors is in series with adjacent groups so that current flows through the interconnectors between the end rings. The resistance of the interconnectors can thus be designed so that effective resistance of the rotor with a four-pole stator connection is as great or greater than that obtainable with an eight-pole connection. The opposite effect may be obtained by arranging the rotor as in Fig. 5(b). In this case the interconnectors are in circuit with the rotor currents on eight poles but not on four poles. The connections can then be designed to have a high resistance to obtain a high starting torque on the high-speed winding and a low resistance on the low-speed winding, as for a lift where the high-speed winding is used for hoisting, and the eight-pole winding for the purpose of braking.

Slip-Ring Motors

The characteristics of a slip-ring induction motor with seven-step rotor starter or controller for use with a motor driving a centrifugal pump, the load torque of which increases with the speed are indicated in Fig. 7. With this controller the motor can be operated at any of seven speeds between 97 and 73 per cent of synchronous by varying the amount of resistance in the rotor circuit. The controller must be designed so that the handle can be left in any position and the resistance units large enough to carry the rotor current continuously without overheating.

This method of speed control has two disadvantages. First, the speed will vary considerably on a varying load; for example with all the rotor resistance in circuit (Step 1) the variation would be from almost synchronous speed to 39 per cent of synchronous speed if the load torque varied from no load to full load. Secondly, the speed reduction is obtained at the expense of degrading power into unwanted heat at the control resistance; at half speed about half the input to the machine is wasted. The safe full-load torque is practically constant so full-load horsepower is proportional to speed.

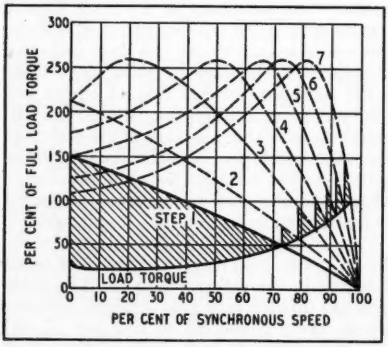


Fig. 6.—Speed-torque characteristics of slip-ring induction motor

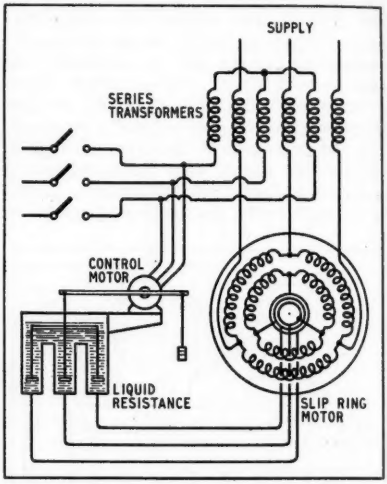


Fig. 7.—Connections for automatic slip regulator

Slip Regulator

On account of its low efficiency, this method of speed control is practically confined to drives requiring occasional slight drops of speed, or for flywheel motor-generators in which sudden loads are supplied from the kinetic energy of the flywheel as its speed falls, as with some rolling mill and winding drives. A rotor-circuit rheostat or slip-regulator (Fig. 7) can be used to cause the speed to fall automatically as the load is applied and to rise as the load is removed to restore the kinetic energy of the flywheel. The rotor-circuit resistance can be controlled by contactors or by a liquid resistance operated by a motor whose torque is controlled by the load on the main motor. On a large machine the liquid resistance is usually kept cool by water circulated through a coil of pipes immersed in the liquid.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Technical Journal Cuttings

THE advice given to students by Mr. A. W. Boase in your issue of June 28th is very sound and I hate to say anything which may detract from its value. Are students in a position to buy copies of all the technical journals every week to enable them to cut out useful articles and file them for future reference? Even if they can, I know from experience that even cuttings can become very bulky and cumbersome, unless weeding-out is done every two or three years.

I have found it adequate, and I think most students, whether at college or as responsible engineers, will also find it adequate, to keep a very large and up-to-date index of the articles or notes which they have seen or heard about.

I strongly support Mr. Boase's point about cross-indexing, and have found it very useful to have a column in which to write just, say, ten words about the article's contents or one's views immediately after reading it. Sometimes two or three words would be quite sufficient, such as "Descriptive, Good," or "Read again." Armed with such an index, the engineer can always refer to the journals he wants at his college or institution library.

London, S.W.1. G. O. MCLEAN.

Arguments for Nationalization

IT is to be hoped for the sake of historical accuracy that the research worker a hundred years hence will not begin his investigation into the affairs of the electricity supply industry in 1946 with the fixed political prejudices revealed by Mr. Eric Neate.

Because the accident of our electoral system has given the nationalizing party a large majority in the House of Commons that does not entitle Mr. Neate to accuse the man in the street of convictions not proved against him. Far more people voted against nationalization than for it. Because supply companies have not felt it necessary to reply to unfounded charges, that does not prove the charges to be founded. And if Mr. Neate had any knowledge of what is going on, and has been going on for years, in the electricity industry entitling him to make a printed record for the benefit of posterity he would certainly not talk of a "belated attempt to put their house in order."

Why *will* these people with, apparently, nothing more than surface knowledge damn whole industries out of hand instead of humbly seeking information before adopting the airs of judge and jury rolled into one!

London, S.W.1. FRANK D. LONG.

Electrical Supplies in Northern Ireland

MEMBERS of this Association have recently become aware of flagrant breaches of the generally accepted methods of trading by the granting of wholesale terms to retailers, and by the provision of electrical supplies to firms not connected with the trade in this area. While it is obvious that these methods of trading are harmful to the bona fide wholesaler, I think it is correct to say that they are also detrimental to the firms concerned in them.

It appears that firms come to do business in Northern Ireland without knowledge of the conditions of the electrical trade, and the persons or firms engaged in it here. If this is so, it is possible that they will, in complete ignorance, commit breaches of the generally accepted methods of trading. Would it not be well for manufacturers and their representatives to acquaint themselves fully of conditions here?

I shall be happy at all times to assist any manufacturers or their representatives who may communicate with me by supplying unbiased and complete information about the electrical wholesale trade in this area.

RALPH S. NEILSON,
53, *Chichester Street*, *Honorary Secretary*,
Belfast. Electrical Wholesalers' (Northern Ireland) Association.

Ball Lightning

IN your issue of June 28th last, Mr. H. M. Sayers described certain lightning phenomena and also referred to the occurrence of a fire-ball at Sheepscombe, Glos.

I consider that there were two sets of phenomena arising out of the original lightning stroke. The sharp crack and the

brilliant illumination simply mean that the main flash of lightning was very close and that the sound and light were simultaneous so far as the observer was concerned. Incidentally, the rumble normally heard from thunder is due to the time taken by the sound of different parts of a long flash taking varying lengths of time to reach the observer.

The sparks which were observed were no doubt due to the collapse of the electrostatic field following the relief of stress by the main stroke. Owing to this, conductors such as electric fittings or water pipes would become charged to a new potential and the potential difference between adjacent objects would be sufficient to cause the sparks observed.

Judging from the Press reports a fire-ball did occur and this could have been generated simultaneously by the main flash. I attempted an explanation of the fire-ball phenomena in an article in your journal dated March 8th last and this explanation still appears to fit in with the observed facts of the fire-ball in this instance, but the other phenomena such as sparks from electric fittings could have occurred without the formation of a fire-ball.

Erith, Kent. E. A. LOGAN,
Borough Electrical Engineer.

Activities at Manchester

Undertaking's Report for 1945-46

BOTH on the generation and distribution sides important construction schemes were in hand at Manchester during the year (to March 31st last) covered by the latest of the Electricity Committee. The Department, of which Mr. R. A. S. Thwaites is chief engineer and manager, made considerable progress with the reconstruction of the Stuart Street station, while at the Barton station regrouping of the 33-kV feeders was completed and work proceeded on the ash-handling plant. Maintenance necessitated increased demands on labour and materials. A major item was the overhaul of No. 5 turbo-generator (50,000 kW) which had completed 57,435 hours' running (91·69 per cent of the possible) since it was commissioned on March 11th, 1938. The general condition of the plant was found to be satisfactory.

The total quantity of electricity generated by the Department during the year was 971·4 million kWh, against 1,010·7 million in 1944–45, the aggregate maximum demand being 249,870 kW (258,530 kW).

With regard to distribution, the laying of three new 33-kV feeders from the Stuart Street station was completed and progress was made with another from the Barton station. Large-scale building developments planned in the Wythenshawe area will require provision for increased supplies. With the cessation of war-time industries there was a decrease from 345·7 million to 313·9 million kWh in large power supplies, but a marked increase in activities in connection with industrial sales has resulted in many negotiations being undertaken with textile firms and a comprehensive survey was made of spinning mills, weaving sheds and finishing works which take little or no supply from the undertaking. A number of conversion schemes were submitted.

Lighting, cooking and heating supplies showed further expansion (from 184·6 million to 207·3 million kWh). Altogether, the Department sold 731·7 million kWh last year compared with 729·5 million in 1944–45. An additional 2,152 consumers were connected, making 198,476. The average price obtained per kWh sold rose from 0·89d. to 0·92d.

Total revenue amounted to £2,916,457 (against £2,797,228), working expenses being £2,611,939 (£2,386,791). After providing for interest charges, etc., amounting to £374,638 (£395,224) there was a deficit of £70,120 as compared with a surplus of £15,213 in the previous year.

Consumers' Controls

A DRAFT Code of Practice for consumers' supply controls for small dwellings was recently circulated by the British Standards Institution for comment under the authority of the Codes of Practice Committee. In this Code recommendations are made for an orderly arrangement of the meter, fuses and main switch. The ultimate form of the complete assembly is not dealt with in the draft Code, but this matter will be covered by a British Standard Specification, which is at present in preparation by the B.S.I. Until such a Specification is published no supply control unit should be referred to as a British Standard unit.

Heat Supplies

REGARDING the report of the discussion on Mr. R. A. S. Thwaites' paper at the I.M.E.A. Convention which appeared in our issue of July 5th, Mr. L. Romero pointed out that the 586 therms per annum estimated by the author as required for space heating in the Manchester three-bedroom house with a floor area of 850 sq ft was about five and a half times as much per cu ft as he found necessary for his own house of double the cubic capacity. In the latter case high-temperature radiant heat was used for warming persons as against low-temperature mainly convective heat designed to keep the temperature of the whole house above a certain minimum value. A serious objection to the use of electricity merely for " topping up " during cold spells would be the on-peak load with poor load factor.

A Universal Plug—Now

Desirability of Immediate Action

By "*The Plain Engineer*"

QUITE early in his forty years' career in the industry, the writer became convinced that electricity supply could make a great contribution towards increasing the standard of living, especially for the lower income class—in other words, that electricity supply, in addition to being a business, could be a great social service and, what is somewhat remarkable for a social service, it would pay its own way.

Hence, when he became principal officer in a municipal electrical undertaking many years ago, he set out with enthusiasm to prove by practical application on a large scale that his theories were sound. The proof was soon provided and the undertaking was organized to give the maximum possible service at the lowest possible cost to every class of consumer or potential consumer. It proved to be very good business indeed and illustrated the truth of Henry Ford's dictum that "if you give your customer real service you can't help making a profit."

Early Discussions

When dealing with domestic electrification it was not long before the plug question obtruded itself: a matter which was debated at length by the I.M.E.A. The writer took some part in these discussions in the early 1930's and, rather to his own surprise, found he had acquired, quite unconsciously, some very strong views on certain aspects of the problem. As a result of these discussions, the I.M.E.A. decided by a majority to recommend officially the adoption of two plugs as the recognized standards. These were of the round three-pin type, in 15-A and 5-A sizes only. With this decision the writer fully agreed, his only regret being that the relatively large size of the then 15-A standard three-pin plug made it impracticable to reduce the number of sizes.

The lengthy controversy brought forth great arguments about the relative merits of round-pin and flat-pin types, and left the writer wondering whether many of those taking a prominent part in it realized that the real need was to get down to an accepted standard with as few sizes as possible. Indeed many of the protagonists appeared to be more concerned with carrying their own points of view than with considering what would provide the maximum advantage to the ordinary household consumer. This attitude of mind probably provides one of the reasons why the supply industry is now promised nationalization. If a large majority of consumers had been satisfied with the service they received, it seems safe to say that politicians and planners would not have got the requisite support for their proposals. Note that it is the attitude of mind that is referred to here and not plugs.

It is disheartening to note from the technical Press that this useless controversy has cropped up again, for the B.S.I. has apparently been requested to provide a Standard Specification for flat-pin fused plugs. The only justification for such a request would be that a majority in the supply industry is in favour of flat-pin plugs. So far from this being the case, the only factual evidence available—the verdict of the I.M.E.A. in the 1930's and the replies to an E.D.A. questionnaire of 1944—proves the exact contrary. One can only assume that B.S.I. has been misinformed about the desires of the industry and wonders why it has been requested to adopt so unusual a procedure as to provide a standard for something which has not yet been produced.

Unnecessary Expense to Householders

The writer's strong views on certain aspects of the plug question were derived partly from studying the needs of the ordinary householder consumer and partly from his own experiences when changing houses, on each of four occasions the plugs having to be changed. The cost was not inconsiderable in view of the considerable amount of electrical apparatus, and the effect was most irritating. A lay householder could well be excused for taking a very dim view of the electricity supply industry if every time he changed his house he was faced with a lot of unnecessary expense. It should be remembered that about 85 per cent of the total houses in the country are occupied by people with very limited incomes. There can be no doubt that a standard universal all-purpose household plug would fill a long-felt want and would be a boon as great,

if not greater, to the ordinary household than even a standard voltage.

When the new type of 13-A round three-pin fused plug came out, the writer promptly obtained a sample plug and socket, carefully studied it and then installed it in his own house for use with a 3-kW radiator. The ability to change the fuse in safety and without any tools was particularly attractive. He concluded that here was the ideal wished for in the 1930's—the means of getting down to a standard plug which could be used for all household requirements. While keenly desiring a standard universal household plug, he realized that the industry would be giving hostages to fortune if the supply were limited to one maker. Inquiries revealed, however, that all the patents included a "licence of right" that enabled any manufacturer to produce the plug upon terms settled by the Patent Office and not by the original patentees.

Yet the only results one has noted from the technical Press appear to be efforts to ensure that it shall not become standard, as witness the abortive effort to get an up-graded 5-A plug and now a British Standard Specification for a fused flat-pin plug. A majority of the industry has already demanded a universal household plug and it seems almost incredible that progress to this end should be obstructed so effectively by a small minority.

Duty to Consumers

Looked at from a modern standpoint, the administrative and technical staffs of electricity undertakings are trustees charged with the duty of giving the maximum possible electrical service at the lowest possible cost to the community they serve. The advantages to be gained by having a single size of universal plug for houses are so manifest that the trustees will be failing in their duty if they allow technical squabbles, or vested interests, to prevent an undoubted boon to be placed at the disposal of the consumer as quickly as possible.

The greatest house-building programme in this country's history is now starting. If ever there was a time propitious for the introduction of a new universal standard plug it is now. There can never be such a good opportunity again. The longer the delay the more houses will be deprived of the boon. If obstructionists have their way it will be at least twelve months before a standard flat-pin fused plug can be in production and probably two years. Furthermore, when it becomes available it is unlikely to be any better than the plug now being made.

It is to be hoped that there are sufficient administrators in the supply industry who accept the principle of trusteeship for the consumer to override factious opposition, shortsighted technical obscurantists and vested interests that stand in the way of giving maximum service to the community. A universal plug is most desirable, a suitable type is available now: let the industry have it adopted as a standard for houses without any further delay. The writer has no interest of any sort, financial or otherwise, in any electrical firm of any description. He is solely concerned with the interests of the ordinary household user of electricity.

Highlands Electricity

North of Scotland Board's Annual Report

IN the second annual report (for 1945) of the North of Scotland Hydro-Electric Board (Blackwood & Sons, Ltd., Edinburgh; 19 pages, 16 figs.; 1s. 6d.) particulars are given of progress made in the constructional and distribution schemes in hand. Constructional Scheme No. 1, incorporating the Sloy, Morar and Lochalsh projects, became operative on March 28th, 1945, and the first sod of a temporary power station at Sloy was cut on June 11th. By the end of the year 45 British workmen and 398 prisoners of war were employed. Orders were placed for four turbo-alternators (head 910 ft). The authorized installed capacity is 130,000 kW. At Loch Morar the station is to be constructed in a mass of rock, so that only its doorway will be visible from outside.

The Tummel Garry project of No. 2 Construction Scheme (three stations aggregating 148,000 kW) was published in February, 1945, but owing to objections raised did not become operative until November 19th. No. 3 Scheme (Fannich 10,000 kW) was authorized on December 17th. No. 6 Scheme (Findhorn-Duntelchaig) is in abeyance in view of objections raised by the Burgh of Inverness. Of the Distribution Schemes, No. 1 (Lochalsh) and No. 2 (Morar) were confirmed in May, 1945, and No. 3 (Gairloch), No. 6 (Orkney Mainland), No. 7 (North Cowal) and No. 8 (Skye) in December. Temporary supplies will, in most cases, be provided, pending the completion of the Constructional Schemes.

The Board exercised its borrowing powers of £3 million to the extent of £163,684 during the year, making with a previous £90,860 a total of £254,544. Capital expenditure at the end of last year amounted to £332,800 (including £21,773 on the construction of generation works) which was met by temporary borrowings.

PERSONAL and SOCIAL

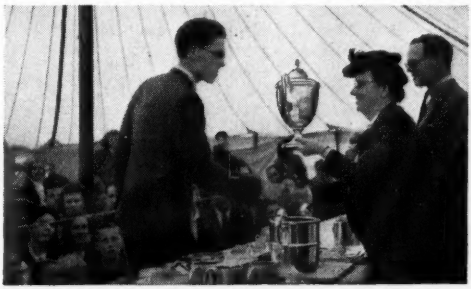
News of Men and Women of the Industry

HIS Majesty the King has approved the appointment of **Professor Ronald N. Arnold,** D.Sc., Ph.D., M.I.Mech.E., Professor of Engineering at the University College of Swansea, to the Regius Chair of Engineering in the University of Edinburgh, which has been vacant since the death of Sir Thomas Hudson Beare. Early in 1940 Professor Arnold became a member of the senior research staff of the Metropolitan-Vickers Electrical Co., Ltd., and until 1942 he was engaged on a number of research projects, many of them of a secret nature.

Mr. Hugh Warren, managing director of the B.T.H. Company, and formerly director of the company's research and engineering, has received the degree of Doctor of Science, *honoris causa*, of Birmingham University. Dr. Warren is a member of several learned institutions and of scientific and industrial committees. He is the author of numerous technical books and papers. His doctorate recognizes in particular his work in industrial research and technical education. He is a director of the Metropolitan-Vickers Electrical Co., Ltd., and of other companies connected with Associated Electrical Industries, Ltd.

Col. B. H. Leeson, managing director of A. Reyrolle & Co., Ltd., has been elected a director of the Consett Iron Co., Ltd.

The fifty-third annual sports meeting of Crompton Parkinson, Ltd., was held on June 15th at Chelmsford. A fortunate change in the weather permitted a highly successful meeting at which twenty-eight items were contested. **Mr. T. H. Windibank,** M.I.E.E., director and general manager, who is president of the Sports Club, addressed the assembly at the prize-giving ceremony and introduced the Mayoress of Chelmsford, Councillor Mrs. H. M. Hodge, who presented the prizes. Mr. J. Hilton, O.B.E., M.I.Mech.E., chief engineer of the Hoffmann Manufacturing Co., Ltd., proposed a vote of thanks to the Mayoress and organizers.



Mr. J. J. Horrex, winner of the half-mile championship at the Crompton Parkinson sports meeting, receiving his cup from the Mayoress of Chelmsford

We regret to learn that **Mr. J. S. Simmons,** advertising manager of the Henley organization, comprising W. T. Henley's Telegraph Works Co., Ltd., Henley's Tyre & Rubber Co., Ltd., and other subsidiaries, has had to retire on account of continued ill-health resulting from injuries received in the 1914-18 war. Before his appointment to this position he was manager of the engineering advertising department of the parent company, having been in their service since 1920. In 1928 he founded *Distribution of Electricity*, which under his editorship has continued publication without interruption ever since. He has had over forty years in the advertising profession and was one of the original members of the Incorporated Advertising Managers' Association, and was awarded the fellowship in recognition of his services in the formation of the Association.

Mr. J. Dunford Smith

Mr. Simmons was succeeded on July 1st by **Mr. J. Dunford Smith** who, after serving in the last war, joined Henley's Research Laboratories early in 1920. In 1929 he became assistant to Mr. Simmons. He has been a member of the Incorporated Advertising Managers' Association from its inception.

Mr. D. Holt, deputy borough electrical engineer, Walsall, has been promoted to the position of borough electrical engineer at a salary of £1,698 per annum. He succeeds Mr. E. A. Newburn, who was recently appointed city electrical engineer of Bath.

Liverpool City Council has approved an increase in the salary of **Mr. E. L. Morland,** superintendent engineer of distribution, from £1,250 to £1,350 per annum. A number of promotions have taken place in the Electric Supply Department. **Mr. G. V. Watson,** high-voltage assistant, becomes chief electrical superintendent (generation); **Mr. J. L. Low,** B.Sc., assistant maintenance engineer, high-voltage assistant; **Mr. G. W. Almond,** district high-voltage engineer, senior mains engineer;

Mr. W. R. Morris, district high-voltage inspector, district high-voltage engineer; **Mr. J. Owen,** electrician, district high-voltage inspector; **Mr. S. Langford,** B.Eng., assistant high-voltage engineer, engineering assistant (distribution), and **Mr. L. Devine,** electrician, assistant high-voltage engineer.

Mr. H. J. Randall, managing director, City of London Electric Lighting Co., Ltd., has been elected chairman of the London Electricity Supply Association. **Mr. H. A. Dibben** has been appointed secretary. The address of the Association is now 60, St. Martin's Lane, London, W.C.2.

Mr. M. Reed, Ph.D., M.Sc., M.I.E.E., has been appointed general manager of the Radio Division of R.F. Equipment, Ltd., in control of production and engineering. Before joining the company Dr. Reed was assistant to the chief engineer, Telecommunications Department, Siemens Brothers & Co., Ltd., having previously been the chief radio engineer of the company.

Mr. Guy H. Langdon, A.M.I.E.E., who, until the end of December last, had been Callender's branch manager in Bristol for thirty-one years, was recently invited to London and entertained to a special luncheon, following a presentation made to him by Mr. Charles Pipkin, on behalf of his former colleagues. Mr. Langdon originally entered the service of the former Callender Company as a contracts engineer and transferred to the sales staff in 1914.

Mr. H. C. Widlake, A.M.I.E.E., chief electrical and mechanical engineer, Plymouth and Stonehouse Gas Light & Coke Co., has been elected chairman of the Devon & Cornwall Sub-Centre of the Institution of Electrical Engineers for 1946-47.

A series of visits to the film studios at Denham has been arranged by the I.E.E. South Midlands Students' Section on July 20th, August 24th and 31st. Transport has been arranged from Birmingham and from Loughborough. Applicants for tickets who reside in the Loughborough area should approach Mr. K. Stephen, Shortcliffe Farm, Shepshed, near Loughborough, whilst others should apply to Mr. S. P. Roper, " Malone," Leyland Avenue, Wolverhampton.

Mr. A. C. MacWhirter, for more than thirty-two years hon. treasurer of the South Wales Branch of the Association of Mining Electrical and Mechanical Engineers, has been elected an honorary member of the Association. He has recently retired owing to ill-health.

Councillor F. W. Smithies (Wolverhampton) has been elected chairman of the West Midlands Joint Electricity Authority, in succession to Mr. C. Dyehouse (West Bromwich). Recently the West Bromwich Town Council revoked the appointment of Mr. Dyehouse as its representative on the Authority of which he had been appointed chairman a short time before. Councillor Smithies is succeeded as vice-chairman by **Mr. C. Heathcock,** a former chairman.

Dr. L. N. Bramley has been appointed electrical engineer to the Plant Engineering Division of the British Iron and Steel Research Association where he will be working on problems associated with electrical equipment of steel works plant generally. Dr. Bramley received his training as an electrical engineer at the City and Guilds Engineering College and following a year's post-graduate research work there joined the Research Laboratories of W. T. Henley's Telegraph Works Co., Ltd. In 1937 he took up an appointment at the Royal Aircraft Establishment at Farnborough and recently relinquished his position there as head of the Electrical Instrumentation Section of the Chemistry Division to take up his new appointment.

Mr. M. S. Thacker, formerly on the staff of Bristol Corporation Electricity Department and now on the staff of the Calcutta Electric Supply Corporation, has arrived in Bristol for a stay of several months.

Mr. A. W. Pannell has resigned his position with the Plessey Co., Ltd., after eleven years' service as export manager, and has joined Messrs. E. L. Edwards and G. A. Upton as a co-director of Edstone, Ltd.

The following appointments within their lighting group organization have been announced by Philips Lamps, Ltd.:—**Mr. R. P. Sayers** will manage the newly formed Lighting Department for fluorescent and other discharge lamps, associated equipment and fittings. This will combine the activities of the departments previously known as " Philora " and " Fittings." The Lighting Department will also institute and operate an illumination advisory service. **Mr. H. I. Chalfont** becomes manager of the Special Lamp Department which will deal with special tungsten lamps, flash bulbs, cycle dynamo sets, electric shavers, and other products. **Mr. K. Lee** becomes lamp sales manager, London and Home Counties.

Alderman C. W. Dixon, chairman of the East Ham Electricity Committee, has been elected to the I.M.E.A. Council as a representative of Group B undertakings.

Mr. M. Seaman, M.Sc., and **Mr. J. F. B. Jackson,** B.Sc., have been appointed to the board of P. R. Jackson & Co., Ltd., a subsidiary of David Brown & Sons (Huddersfield), Ltd.

Obituary

Mr. A. Binns.—We regret to record the death, on July 2nd, of Mr. Asa Binns, formerly chief engineer to the Port of London Authority and a past-president of the Institution of Mechanical Engineers.

Wills.—Lady Ella Mary Watson, wife of Sir Duncan Watson, M.I.E.E., left £1,443 gross (net personalty £1,392).

Mr. Thomas Meech, a director of Burdette & Co., Ltd., electrical engineers, left £1,538 gross (net personalty £450).

Spare-Time Employment

Employers' Action Against Rival Concern

By F. E. Sugden, A.C.I.S., Barrister-at-Law

FREQUENTLY full-time employees undertake spare-time employment for pay. Whilst an employer has no say in the manner in which an employee occupies his spare time, a case which recently occupied the attention of the Courts shows that he has definite jurisdiction if the employee uses his spare time to assist a rival firm and may obtain an injunction against this rival concern. Even if an employer has allowed an employee to work in his spare time for another firm, and that has been the custom for many years with many concerns, he can, at any time, stop it if he so wishes.

In the case in question, which went to the Court of Appeal, the appellant company produced goods in which the making and assembling required considerable skill. The respondent company, a newcomer in this particular field, also manufactured these goods. The appellant company had amongst its employees five highly-skilled workmen who had been in its employ for several years on an agreement subject to twenty-four hours' notice. Sunday was a free day. Without their employer's knowledge or consent these five employees, at the invitation of two directors of the respondent company and two former employees of the appellant company, worked on Sundays for the respondent company for a considerable period. There was no evidence that they had made use of any confidential information.

Result of Appeal

On an appeal against the refusal of an interlocutory injunction (that is a temporary injunction which is granted until a case is fully tried), restraining the respondent company from employing or procuring these employees to be employed by them, the question for consideration was whether it was at least a prima facie breach of contract on the part of these employees to devote their spare time, or part of it, to the service of the respondent company and, if so, whether, the appropriate remedy was an interlocutory injunction. It was contended on behalf of the respondents that this was not the case for an injunction because the remedy of the appellant company was to dismiss the employees for misconduct.

The Court of Appeal held that the appellant company had made out its case of breach of the employees' obligation to serve them with fidelity, which was an implied term in the contract of service. There was a sound practical reason why the employees should not be joined in the action and therefore the Court decided that an interlocutory injunction should be granted against the respondent company restraining it from employing the persons in question.

In my opinion this decision would not apply to part-time employees but only to full-time members of the staff. Again I consider that it does not prevent an employee from carrying out spare-time work provided the interests of his employer are not affected in a competitive way. If an employer requests another not to employ a specific member of his staff and he refuses there is no doubt that an injunction will be granted and the delinquent employer will have to bear the costs of the proceedings. If an injunction is granted and the employer refuses to abide by the injunction without an appeal and carries on as formerly, then it would be contempt of court and he can be sent to prison or fined, or both, for this.

Soviet Five-Year Plan

TWO booklets, "The Five-Year Plan for 1946-50" (104 pp. ill.), price 1s., and "Report on the Five-Year Plan for 1946-50" (39 pp.), price 6d., have recently been published by the "Soviet News," 630, Grand Buildings, Trafalgar Square, W.C.2.

The first of these booklets contains full text of the law on the Soviet Five-Year Plan for 1946-50. The second is a companion to the former. It is the report made by N. A. Voznesensky, chairman of the State Planning Commission of the U.S.S.R., to the Supreme Soviet.

Among the aims of the plan is the increasing of the generating capacity of power stations in the U.S.S.R. by 11,700,000 kW in the five years, raising the total to 22,400,000 kW. It is intended that the total power output in 1950 shall be 82,000 million kWh. The manufacturing programme includes 2,906,000 kW of steam turbines, 1,122,000 kW of water turbines, 624 motors up to 100 kW and 9,000 of over 100 kW, and 220 long-distance locomotives. There will be progressive electrical development in industry, railway traction and agriculture.

E.C.A. Annual Meeting

Unemployment Through Lack of Supplies

THE annual general meeting of the Electrical Contractors' Association and its allied organizations, N.E.C.T.A., Ltd., and the National Federated Electrical Association, was held on June 3rd. In the course of his address and report upon the past year, the president, Mr. R. H. M. Drake, B.A., touching upon the subject of electricity supply nationalization, said that the service could only be judged by the benefit derived from it by the public. He claimed that so far as the electrical contracting industry was concerned the service given by the established electrical contractor in personal touch with the consumer would be better than anything which could be rendered available by any bureaucratic trading entity.

Mr. R. H. M. Drake

Complaints were heard of commercial monopolies but these could only justify themselves by the service which they gave. A Government monopoly, however, was above the law and continued to exist without any regard to its efficiency.

While it was recognized that in this period of reconversion some control was necessary, the president contended that control had left the electrical contractor and the community in a worse state than they had expected. The W.B.A. scheme had been introduced without any regard to the peculiar requirements of the industry. Although labour was available and work was crying out to be done the electrical contracting industry was faced with substantial unemployment because material was not available. The W.B.A. scheme had not succeeded in directing material into the recognized channels ; this led him to consider again the vexed question of the compulsory registration of the contractor and the operative.

Two separate Government Departments had refused to initiate legislation to secure this end. The Government was rightly spending large sums of money in training disabled and demobilized persons to ensure, with the aid of the industry, that they should not enter the industry until they had achieved the necessary skill and yet there was no restriction upon the entry of thousands of untrained workers as employers or free-lance master-men. It was estimated that about 5,000 of these so-called electrical contractors had started in business, in addition to a large number of retailers many of whom had no previous experience of electrical retailing. Thus, while the genuine electrical contractor and retailer was unable to secure supplies made to acceptable standards, these others were obtaining considerable quantities of shoddy and dangerous material.

Referring to the cost and quality of labour, Mr. Drake said that undoubtedly war weariness and unsatisfactory diet had led to a fall of output, but did not account for it all. He said that while the hourly rate of pay in the electrical contracting industry had risen by nearly 50 per cent above the pre-war figure, output had dropped by 40 per cent. Thus, the labour cost for a job had increased by 150 per cent, in face of the Government's urgent plea for higher production. Higher wages and other benefits could only be given if the public was able to pay the cost.

The president commended the work of the Fair Trading Council and spoke of the good relations existing between the E.C.A. and the manufacturers' organizations.

During the past year the membership of the Association had increased by 161 to 1,736 and the number of applications now under consideration indicated even greater progress. He deplored the apathy which still existed among some members and appealed to them to play a greater part in the Association's affairs.

Other matters to which Mr. Drake referred were the retail trading campaign inaugurated during the year ; the work of the E.C.A. Technical Committee ; and the Association's membership of the Federation of Associations of Specialists and Sub-Contractors and of the British Employers' Confederation. He mentioned with regret the death of Mr. A. G. Bruty, past-president, and two members of the Council, Messrs. T. H. Wathes and H. Jones, and he paid tributes to the officers and staff of the Association for their work during the past year.

The accounts of the three associations, presented by the chairman of the Executive Committee, Mr.W. H. Walton, were unanimously adopted. At a meeting of the Council Mr. Drake was re-elected president for a further year and Mr. R. A. Parsons was elected a vice-president in recognition of his work for the Association over many years.

Radio Monographs.—The Cambridge University Press, Bently House, 200, Euston Road, London, N.W.1, announces a new series of monographs on war-time advances in radio methods and apparatus. Nine such books are in active preparation; two of them, on " Radio Navigation Devices," by Dr. R. A. Smith, and on " Velocity Modulated Electron Tubes," by Mr. A. H. Beck, are to be printed at once.

Mobile Power Plant

Economical Use of Space

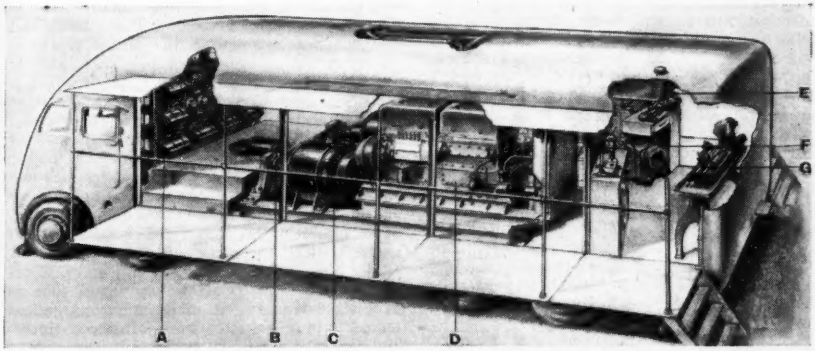
MOBILE generating plant of appreciably larger capacity than machines of this kind hitherto available has been developed by Lang Wheels (Manufacturers), Ltd., for a range of outputs of from 50 to 250 kW as multiple unit combinations to operate electrically in parallel.

The whole of the equipment is mounted on a self-propelled vehicle, designed for a road speed of 20 m.p.h., which complies with the requirements of the Road Traffic Acts. The adapted Foden chassis, specially strengthened to bear 20 tons, is mounted on eight wheels with twelve pneumatic tyres and the aluminium-sheet body is coach built. When closed for travelling it is 7 ft 6 in. wide; the lower halves of the side shutters drop down on to supports inserted in the framework to form decking 3 ft wide along both sides of the engine room, while the top halves of the side shutters lift up to form side canopies supported from the decking by chrome-plated stanchions and guard rails. Four hydraulic jacks support the vehicle when stationary; the main oil-fuel tank and two exhaust silencers are concealed in the roof.

The tail end is formed into a small workshop containing a 4 in. lathe, drill and portable welder. Next are two radiators for water cooling the engine cylinders as well as the lubricating oil, their fans being belt driven and their pumps chain driven from the shafts of the duplicate generating sets, which are mounted longitudinally with a gangway between them. The remarkably compact Ruston and Hornsby oil engines are of the four-cycle compression-ignition 6 VPH type. Each develops 150 B.H.P. at 1,250 r.p.m. and is directly coupled to a Lancashire 100-kW dynamo, level compounded and screen protected, with perforated metal guards round the commutators. To withstand damp, their armatures have been insulated mainly with mica. The shunt coils are wound with cotton-covered wire, each turn coated with heat-conducting enamel and the whole winding vacuum impregnated.

Centrally between these two generators, but sunk below the switchboard platform forward, is a third dynamo of 50 kW limited to 1,500 r.p.m. and coupled through a special power take-off to the carden shaft. It is thus driven by the Gardner engine which drives the vehicle, developing 105 B.H.P. at 1,750 r.p.m.

The four-panel Foster switchboard backs on to the vehicle driver's cab. On it are mounted individual ammeters and voltmeters, a load summating meter, voltage regulator and an eight-day clock. Each dynamo is protected by a circuit breaker incorporating overload and reverse current trips; each set can be started by push button from the switchboard. All knife switches are enclosed within metal covers and each of the six outgoing trailing feeders is protected by two 400-A re-wirable fuses on a separate panel at the back oft he switchboard.



Mobile 400-B.H.P. power generating vehicle for driving and lighting travelling fair and circus

A.—Generator and feeder switchboard. B.—50-kW dynamo driven off vehicle carden shaft. C.—Two 100-kW generators. D.—Two 150-B.H.P. oil engines. E.—Extra 70 gal fuel tank F.—Portable welder. G.—4-in. lathe.

The first vehicle with a d.c. output of 2,300 A at 110 V, with a fuel consumption of 14 gallons per hour which was inspected in operation at North Willesden last week, has been purchased for electrically driving and lighting a travelling fair and circus owned by Mr. W. Smart. The caravan dwellings are equipped with electric light and radio, including an all-electric kitchen caravan fitted with a built-in refrigerator, cooker, kettle and water heater for the sink.

PARLIAMENTARY NEWS

By Our Special Reporter

Generating Costs

ON July 2nd in the House of Commons, Mr. Gaitskell, speaking for the Minister of Fuel and Power, said that the average total cost (including capital charges) per kWh of electricity sent out from generating stations in 1939 was 0·3379d. of which the actual fuel cost was 0·1520d. The corresponding figures for 1945 were 0·5339d. and 0·3307d. respectively.

Standardization of Voltage

Regarding the progress made in the standardization of voltage since 1939, Mr. Gaitskell said that at the outbreak of the war schemes for the general standardization of voltages were deferred. Arrangements were, however, now being made to standardize low voltage at 240 volts. Though there would ultimately be some reduction in manufacturing costs, it was impossible to indicate in terms of money the value of standardization, the case for which was primarily based on its advantages to consumers.

Scottish Scheme

Mr. Malcolm MacMillan asked the Secretary of State for Scotland if he was aware of the dissatisfaction in the Outer Hebrides at the delay by the North of Scotland Hydro-Electric Board in undertaking electrification in that area; and what immediate steps were contemplated.

Mr. Fraser said the Secretary of State was aware from statements in the Press that dissatisfaction had been expressed. The Board had prepared and submitted to the Electricity Commissioners for approval schemes for the distribution of electricity in Lewis and in North and South Uist and the adjacent islands. A scheme for Harris and Barra would be sent to the Electricity Commissioners shortly. The Board had also, in order to provide supplies quickly, bought surplus R.A.F. Diesel generating plant at Stornoway and Benbecula.

Priority Scheme

Lieutenant Commander Clark Hutchison asked the Minister of Works why no steps were taken to consult the contracting side of the electrical industry in Scotland before the W.B.A. priority scheme was introduced. Mr. Wilson said that the priority distribution scheme was brought to the notice of the Electrical Contractors' Association before its introduction. He would be pleased to consider any representations from Scottish electrical contractors.

Production of Components

Major Ramsay asked the Minister of Works whether he would take immediate steps to speed up delivery of the many outstanding contractors' orders for electrical materials, as non-delivery of these materials was at present holding up building programmes throughout Scotland, and whether he was aware that journeymen had been discharged from the electrical industry in Scotland, owing solely to lack of materials in this industry. Mr. Wilson said that the Minister of Supply was taking all possible steps to increase the production of electrical components. The specific cases forwarded were being inquired into.

Call-up of Apprentices

On July 3rd, on the motion for the adjournment, Mr. Swingler raised the subject of the call-up of apprentices in the engineering industry, and the decisions of the Government and the Minister of Labour regarding the call-up and training of apprentices in electrical engineering. The electrical engineering section of the industry was faced today with a severe crisis in the recruitment of young men, and with the great and primary problem of the supply of skilled craftsmen and technicians. The Percy Committee on "Higher Technological Education" quoted the estimate of the Institution of Electrical Engineers that we should require annually, to train as technical assistants and designer draughtsmen in the electrical engineering industry, 1,800 men per year, and as draughtsmen and craftsmen 3,200, making a total of skilled intake into the electrical section of the industry of 5,000 per year. They could compare that figure with the fact that in 1943 the total output of the tradesmen in higher certificates or degrees from the universities was 3,000 from the whole of the engineering industry and with the figure, in the years before the war, of the output in this country of civil, mechanical and electrical engineers, of a total of 2,100.

Mr. Ness Edwards, the Parliamentary Secretary to the Ministry of Labour, said that as from next January 1st, all genuine apprentices serving a proper apprenticeship in the engineering industry and in all other industries would be deferred until their apprenticeship had been completed. Compared with other industries, the engineering industry was actually having preferential treatment in the matter of deferment.

In the Navy, correspondence courses and books on technical subjects were available to these apprentices, on application to the local, education officer. In particular, there was a course in electrical engineering, leading up to the City and Guilds certificate. In the Army it was the intention to provide facilities for continuation of technical studies as far as Army conditions permitted. In the Air Force it was the aim to provide technical and educational facilities on a voluntary basis.

COMMERCE and INDUSTRY

Plant Production in Scotland. English Electric Bursaries

E.T.U. Conference

A RULES revision conference of the Electrical Trades Union was held at Hastings this week. In his address, the president (Mr. F. Foulkes) referred to the review of the wages structure now being made by a joint committee of the Engineering Employers' Federation and the Engineering Joint Trades Movement and said that they were still determined to obtain "the rate for the job" irrespective of the sex of the person employed. The membership of the Union had grown from 63,877 in December, 1938, to a present figure of 138,567. Mr. Foulkes said:—"We have organized electrical workers—supervisory, skilled, semi-skilled and lesser skilled, male and female—more extensively and in a greater variety of industries than ever before in the history of the Union."

Scottish Plant Contracts

The North of Scotland Hydro-Electric Board announced last week that contracts to a total value of £163,000 had been placed with Bruce Peebles & Co., Ltd., for electrical plant for the generating stations at Loch Fannich (Grudie Bridge) and Morar. The company will construct two 12,000-kW alternators for the Grudie Bridge station and the hydraulic turbines will be manufactured by the Harland Engineering Co., Ltd. This is a new venture for the Harland Company, and is the first step towards the creation of a new industry in Scotland which will cover the manufacture of complete hydro-electric plant. The generators will be the largest yet built in Scotland. They will each weigh over 120 tons and will measure 16 ft in diameter. Bruce Peebles will also supply two 300-kW turbo-alternators for the Loch Morar scheme in Inverness-shire, Boving & Co., Ltd., supplying the turbines.

Maintenance and Repair Work

Following representations regarding wiring installations and equipment, the Bermondsey Electricity Committee has had a reply from the Ministry of Health to the effect that consideration is now being given to the possibility of arranging for some form of block priority to be given to local authorities and statutory undertakings to cover their essential maintenance and repair work and notification will be given when a decision has been reached on the matter. Meanwhile priority certificates should not be issued for maintenance and repair work.

Token Imports from the United States

On April 8th it was announced that arrangements had been made to allow a small flow of "token" imports of certain goods from Canada. The Board of Trade announces that arrangements have now been made to admit token imports of similar goods from the United States at the same rate of 20 per cent per annum, by value, of American manufacturers' pre-war trade with the United Kingdom in the goods in question. Applications for licences to import these goods will be considered only when accompanied by evidence from the United States Office of International Trade and Department of Commerce identifying the goods which are the subject of the application with the output of a specified American manufacturer. Such evidence should be applied for by the American manufacturer of the goods or by his export agent in the United States, and when obtained, it should be sent to the importer in the United Kingdom, who will then make application for the import licence. The new procedure does not affect applications for import licences in respect of goods which are not covered by the list of goods subject to the token import policy. Such applications will continue to be dealt with under the existing procedure.

The list of goods includes: Carbon electrodes; industrial porcelain insulators; cooking and heating appliances; vacuum cleaners and parts; dry batteries (torch and high tension); and sparking plugs.

Trade with America

Prospects for British manufacturers in the American market are briefly reviewed in Economic Paper No. 7 issued by the American Chamber of Commerce in London (price 1s). In this, Mr. F. E. Daniels analyzes the United States Tariff Commission's forecast entitled "Post-War Imports and Domestic Production of Major Commodities" with particular reference to United Kingdom products. It is stated in the introduction that, generally, United Kingdom exports to the United States could reach three times the 1939 figure of $122 millions, allowing for only a small increase on 1939 prices. It is recalled that these exports reached a total of $350 millions in 1929. America's imports of electrical apparatus before the war was a small item in the list, amounting only to about $1 million, of which Germany provided about 70 per cent. The Commission estimates that this might swell to between $3 and $8 millions "dependent upon German output, and upon the future of cartel arrangements which in the past regulated world trade."

Electrical Demonstrators

At the recent I.M.E.A. Convention Alderman Sir William Walker referred to the importance of demonstrators in the electrical industry, and to the question of their salaries. These matters have occasioned much discussion, and a statement on this question just issued by the Electrical Association for Women is therefore of particular interest. It is pointed out that the expansion of domestic electrification calls for very varied knowledge and experience on the part of demonstrators. The bare essentials in domestic science acquired in the first year of training should be augmented by a second-year course affording opportunities for demonstration experience and practice; for training in voice production; for obtaining a working knowledge of large-scale catering; and for taking a more advanced course in cookery. Domestic science training colleges and domestic science depart-

ments of technical colleges throughout the country are increasingly giving attention to the special needs of the electrical industry, and it is suggested that engineers should state their requirements to the local colleges. Proposals are now afoot to equip colleges with far more numerous and up-to-date types of electrical apparatus, but it is also hoped that the extension of training will mean that students will spend some time in the electricity showrooms, and at the works where domestic electrical appliances are made. The formation of a professional organization for the women demonstrators was announced in our last week's issue.

Travelling Exhibition in Housecraft

Following on its recent award of five Electrical Housecraft Scholarships tenable at domestic science colleges in different parts of the country, the Caroline Haslett Trust has now been able to make the necessary arrangements for providing a Travelling Exhibition. The Exhibition holder, who must possess the E.A.W. diploma in electrical housecraft, will travel in the U.S.A. for two to three months to study home economics, particularly in the application of electricity to housecraft. She will meet the leading women of the American home economics world, and will acquaint herself with publicity and general liaison methods successfully adopted over there. She will visit works where domestic electrical equipment is manufactured, and her travels and contacts will also enable her to see the latest electrical developments in operation. On her return she will be expected to lecture on the results of her researches.

Award to Widow

At the Court of Sessions, Edinburgh, last week Lord Keith awarded sums totalling £1,646 to the widow and three children of John McGhee in an action against William Beardmore & Co., Ltd. Deceased fell into a moulding pit at the company's Linwood Works, near Paisley, while carrying a portable electric hand lamp and cable. Plaintiffs claimed that he fell through receiving a shock owing to some defect in the cable or lamp. In holding fault established against the respondents, Lord Keith said that the defect in the apparatus must have been in existence for some time and might have been discovered by means of a proper system of inspection.

Equipment of " York " Aircraft

The first of twelve " York " transport aircraft has just been delivered to British South American Airways, Ltd. The provision of pre-cooked, frozen food and the installation of electric cooking and heating equipment makes it possible to have three-course meals properly cooked and well served. The galley equipment, which operates from a 24-V supply, includes two G.E.C. 750-W hot-cupboards, a 1-kW hotplate, and a 2-gal, 1-kW urn, all of which have been specially designed for use in aircraft. The hot-cupboards have five heater elements, separately switched to give close control of temperature. The main water supply is provided from a 12½-gal tank fitted with a 150-W immersion heater which is thermostatically controlled. All the switches are grouped on a control board in the galley. As a safeguard against overloading the switches for the urn and hot-plate are arranged with a change-over switch to prevent both being used at the same time. The lighting equipment includes individual reading light fittings for each seat. A steward control system comprises a buzzer and an illuminated panel in the galley.

Rubber Bonded to Metal

An exhibition held recently at Birmingham by Rubber Bonders, Ltd., demonstrated a new process by which rubber is bonded or welded to metal. Photographs and diagram indicated the properties and manufacture of rubber, both natural and synthetic, and visitors were shown how, by the electro-deposition of brass, engineering metal parts were prepared to receive the rubber. The rubber and brass metal parts were then seen entering and leaving various types of mould. Examples of the application of rubber-bonded-to-metal ranged from minute couplings used on torque instruments to marine couplings of 6,000-7,000 H.P. A special demonstration showed the effect of mounting an out-of-balance high-speed motor unit on rubber mountings. A tramwheel with a flexible centre in the form of two rubber-bonded-to-metal sandwiches was also shown.

Safety Electrical Equipment

The second edition of " Safety Electrical Equipment and its Use," by S. W. Richards, M.I.Min.E., of the Mines and Flameproof Equipment Department of the General Electric Co., Ltd., includes new descriptive matter on the use of fluorescent lighting in mines and other inflammable situations, on the design of G.E.C. flameproof tubular and immersion heaters and on the design of a new G.E.C. flameproof conduit joint. There are also additional notes on the characteristics of inflammable gases and liquids. A table shows, at a glance, the flash-points, ignition temperatures and the explosive limits of the many solvents and gases now used in industry. The book is obtainable free from the G.E.C. Publicity Department, Magnet House, London, W.C.2.

Hydraulic Engineering Bursaries

Brief reference was made in our issue of June 21st to the establishment of bursaries in hydro-electric engineering established by the English Electric Co., Ltd.; the company has now sent us some further particulars of these. It is mentioned that the Hawksley Hydraulic Laboratory at the City and Guilds College, built in 1913, has played an increasingly important part in the advancement of hydraulic engineering. Recently a Chair of Fluid Mechanics and Hydraulics Engineering has been instituted by the University of London, and the post has been accepted by Dr. C. M. White, who has directed the work of the Laboratory since 1933.

To encourage the training of British engineers to play their part in hydro-electric expansion, Sir George Nelson, chairman and managing director of the English Electric Co., has recommended his board to make a contribution of £2,000 per annum to the work of this department of the Imperial College of Science and Technology. This will provide six bursaries each year for advanced study in the problems of hydro-power

engineering. The department has been thus enabled to increase its full-time teaching staff, which will still further be strengthened by the part-time services of Dr. Charles Jaeger and other members of the staff of the English Electric Co. who are being lent for this purpose. The first awards will take effect from October, 1946, on the recommendation of a selection committee of the College.

Machine Tool Sales

Three additional selling centres for Government surplus machine tools will be opened by the Ministry of Supply on July 23rd at Elstow, Kempston Hardwick, Bedford; Capenhurst, near Chester; and Saltney Ferry, near Chester. The opening of these depots will increase the number of machine tool selling centres to eight.

An "on-site" sale of surplus machine tools will be opened at the Rolls Royce Factory, Hillington, Glasgow, on July 31st, at 10 a.m. Approximately 600 machine tools consisting of autos, capstan lathes, turret lathes, millers, grinders, drillers and many miscellaneous types will be offered for sale. The sale closes on August 6th and any unsold machines will be on view daily (except Saturday and Sunday) from August 7th until August 13th for the purpose of competitive tendering. Prospective buyers may visit the site between those dates to view the residual machines and obtain tender forms.

Gauge and Tool Makers' Association

The Gauge and Tool Makers' Association is planning a visit to the International Fair in Prague, which will be held from September 15th to 22nd. The Association is also arranging for a party of directors of member-firms to visit the United States next year, to coincide with the annual exhibition and convention of the American Society of Tool Engineers.

Transformer Prices

Replying to representations by the Stoke Newington Electricity Committee about transformer price rings, the Ministry of Supply states that while the Government at present has no powers to put aside such agreements, it can use its traditional powers to deal with any excessive prices resulting from agreements. The Ministry understands, however, that in the case referred to by the Electricity Committee the price quoted was not regarded as unreasonable.

Switchgear Modifications

Before the war, Crompton Parkinson, Ltd., supplied to the Capetown undertaking forty-one "DA.2" truck-type switchgear units incorporating "TB.17" 11-kV, 100-MVA breaking capacity oil circuit breakers. Extensions to the supply system now make it necessary to replace these with units of 250 MVA breaking capacity. To effect this replacement at the minimum cost, it was required to accommodate the new switchgear in the space already occupied by the 100-MVA units. The existing "DA.2" trucks are readily adaptable to accommodate the larger breakers, but some interior reconstruction of the withdrawable truck is necessary. The fixed chambers, and the busbars, etc., remain unaltered.

The incorporation of a 250-MVA breaker in the "DA.2" truck was made practicable only by the development of the "TB.30" breaker, which has side-blast baffle arc control devices and S.L.100 self-aligning finger contacts. The Capetown undertaking is itself carrying out the modifications, the company supplying the necessary breakers together with current transformers, connections and steel work. To avoid any circuit being out of commission while its switchgear unit is being modified, a spare truck, complete with "TB.30" breaker, is being provided.

Forty-Hour Week

The Horstmann Gear Co., Ltd., informs us that it has adopted a five-day (forty-hour) working week at its Newbridge and Albion works. The company says that it is convinced that by offering shorter hours together with good working conditions more workers of the best type will be attracted, and its present operatives will be able to maintain a good standard of workmanship and increase production.

Discounts at Croydon

The Croydon Town Council has agreed that trade discount on cash sales to the public at the Corporation's electricity showrooms shall be apportioned in the proportion of 75 per cent to the Corporation and 25 per cent to contractors registered with the Corporation, instead of 20 per cent. The revised scale, which will operate until the matter is further reviewed, was introduced on representations from the contractors.

Fulham Commercial Institute Courses

Courses of instruction arranged by the Fulham Commercial Institute for members of the staffs of electricity supply undertakings cover electricity supply and accounts, administrative practice, electricity law, statistics, economics and mercantile law.

Lighthouse Equipment

The war has wrought havoc with lighthouse equipment all over the world and hundreds are now being repaired and re-equipped. Oil-burning marine lights are also being electrified in considerable numbers. Recent inquiries and orders received by Chance Bros., Ltd., who manufacture complete lighthouse equipment, have come from Trinity House, the Crown Agents, China, Finland, Greece, Iceland, India, New Zealand, Norway and Yugoslavia.

Reports on German Industry

The latest list of reports by industrial teams upon various branches of German industry include the following:—CIOS XXXI/1, "Establishments of the Forschunganstalt der Deutschen Reichspost (Research Institute of the German Post Office)" (4s); CIOS XXXI/50, "German Cold Cathode Tubes. Siemens Reiniger Werke, Rudolfstadt." (3s 6d); BIOS 183, "Report on Investigation of the Design and Operation of High-Voltage Networks in Central Germany" (10s). BIOS 258, "Carbon Electrodes, I.G. Farben Griesheim" (1s.); CIOS XXV—12,

"C. Lorenz, A.G.: Radar and Radio Equipment: Details of Organisation" (1s. 6d.); FIAT 560, "New Vacuum Tube Techniques for the Telefunken Rohrenwerke, Berlin" (2s.). A limited number are available at the Stationery Office and copies may be inspected at the chief public libraries and other institutions.

New Factories and Extensions

On June 26th Mr. C. B. Colston, C.B.E., chairman and managing director of Hoover, Ltd., cut the first turf for a new Hoover factory at Pentrebach, Merthyr Tydfil. The initial factory, in which household electrical labour-saving devices will be produced, will cover approximately 80,000 sq ft on a site of 27 acres, 13 acres of which will be devoted to sports club and welfare purposes for the employees.

Ericsson Telephones, Ltd., are negotiating for a 50,000-sq ft factory at Southwick, Sunderland.

Ward & Goldstone, Ltd., have leased Burton's Mills, Atherton, and will commence production there within a few weeks.

The Philips Works at Blackburn is undergoing considerable extension which when completed in about twelve months' time will add some 100,000 sq ft of floor space. Between 800 and 1,000 more people will be employed than at present, labour supply permitting.

Society of Inventors

A branch of the Society of Inventors has been formed in Birmingham. It is intended to hold regular meetings at the Chamber of Commerce, and the next meeting has been fixed for July 18th. Mr. F. C. Auliffe, 36, Wootton Road, Finchfield, Wolverhampton, is hon. branch secretary.

The Hertfordshire Show

The Northmet Power Co. and the Watford Electricity Department have arranged a joint exhibit at the Hertfordshire Show, which is to be held at Cassiobury Park, Watford, next Wednesday. Among a display of electrical appliances for the farm and home there will be a number of new items, including a meter which measures the moisture content of grain, an electric soil sterilizer, hedge trimmer and vulcanizer. Demonstrations will be given throughout the day of dairy equipment, barn machinery, pumping, egg testing and grading, home laundry and fruit bottling.

Batti-Wallahs' Luncheon

The next luncheon of the Batti-Wallahs' Society will be held at the Connaught Rooms, Great Queen Street, W.C.2, on Thursday, July 25th. An address will be given by Admiral of the Fleet the Earl of Cork and Orrery, G.C.B., G.C.V.O.

Trade Announcements

The Yorkshire Switchgear & Engineering Co., Ltd., has moved its London offices to 133/5, Grand Buildings, Trafalgar Square, London, W.C.2 (telephone: Whitehall 3530). At these offices space is available for the display of specimens of the company's latest productions, including high-voltage and low-voltage switchgear, for indoor or outdoor tropical use and for overhead transmission lines.

Mr. J. Bayley, representative of the Ransome & Marles Bearing Co., Ltd., for nearly thirty years is no longer taking an active part in the work of the area but he remains available as consultant and adviser. He is succeeded by his son, Mr. J. C. Bayley, by whom he has been assisted for many years.

The head offices of Linealux, Ltd., are now at 142, Liverpool Road, London, N.1 (telephone: North 4841–2).

Trade Publications

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—Illustrated brochure describing a three-part consumer's service unit for controlling domestic sub-circuits.

Hellermann Electric, Ltd., Goodtric Works, Brewer Street, Oxford.—Illustrated leaflets respectively concerned with (No. A45) moulded plastic "Helvin" end-sleeves and covers in over forty shapes and sizes for waterproofing junctions; (No. A42) stethoscope for medical and engineering uses.

Churchill Machine Tool Co., Ltd., Broadheath, near Manchester.—Illustrated pamphlet (VB.2) dealing with slideway grinding machines.

Applicants should write on their firms' business notepaper.

Annual Holidays

The works of Mitchell Electric, Ltd., will be closed from July 13th to 20th, both dates inclusive. Arrangements have been made for the receipt of goods. The works will also be closed on August 5th and 6th.

The works and offices of the Phœnix Telephone & Electric Works, Ltd., will be closed from July 27th to August 5th inclusive.

The Greenwich and Farnborough works of the Telegraph Construction and Maintenance Co., Ltd., and Submarine Cables, Ltd., will be closed from July 27th to August 6th. A skeleton staff will deal with urgent requirements.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

Small portable distilling apparatus on heat-pump principle with combined evaporator and condenser. (A form used in Switzerland was described on page 677 of the *Electrical Review* of May 3rd).

"HOT-TAP" water heater.

"CONSTEAD" unit for fluorescent lighting fittings.

"LAMOUR VANQUEUR" fittings.

Pressure-Gas Cables

Survey of Various Types

EARLY in the past decade the oil-filled cable held the field for 66 kV (single- and three-core) and 132 kV (single-core) and still retains its reputation for reliability. Recent modifications in design include pressure tanks incorporating air cells at several atmospheres for use with high static heads of oil, and a moderate increase in oil pressures, reducing the number of stop joints by 25 per cent and halving the capacity of the tanks, which are now buried pre-cast concrete tubes. Increased maximum stresses have correspondingly reduced dimensions of the cable. The adoption of non-magnetic oil ducts has raised current carrying capacities by about 4 per cent. Gassing at joints has now been eliminated by improvements in oil and loss of oil through faulty sheaths has been obviated by modern methods of lead-press operation.

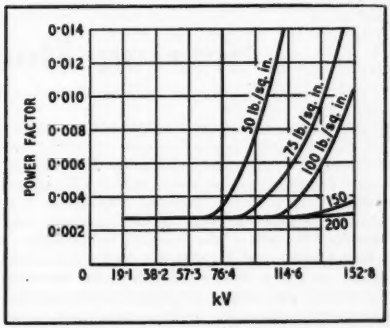
Three Main Types

The foregoing summarizes the reference to this type of cable in a paper presented by DR. P. DUNSHEATH and C. H. JOLIN at the C.I.G.R.E. Conference in Paris last week on "Super-Tension Cables—Recent Developments in Great Britain." The authors then go on to describe the evolution of designs in which the suppression of ionization in voids is done by means of a superimposed gas pressure.

These cables have been available for large-scale trial on systems for about ten years and are now represented by three main kinds: the "gas-cushion" or mass-impregnated pressure type, employing normally impregnated paper dielectric, between which and the lead sheaths is a gas (e.g., nitrogen) under pressure; the "gas-filled" type with pre-impregnated paper dielectric carrying no free compound, spaces being filled with gas under pressure; and the "compression" type with impregnated paper dielectric and having two lead sheaths with gas under pressure between them.

The gas-cushion cable, which was described by Dr. Dunsheath in the *Electrical Review* of May 4th, 1945, with reference to the installation at Barrow, has a typical maximum stress at working voltage at the conductor surface of 85 kV per cm, at which a gas pressure of 75 lb per sq in. is stated to be enough to eliminate ionization, so that the 200 lb per sq in. adopted represents a high factor of safety. Both three-core and single-core 132-kV installations have been in commission for about three years.

Three-core cable is slightly cheaper than three single-core cables, but where the maximum lengths that can be handled are decided by the weight on the drum, greater lengths of single-core can be used with a consequently reduced number of joint bays; single-core joints, too, are more easily made. In view of the much lower dielectric strength of impregnated paper along its length compared with its transverse strength, joints and sealing ends introduce major problems; the methods adopted to overcome these are an important feature of the article referred to above.



Relationship between power factor and operating voltage to earth for 132-kV gas-cushion cable

Main features of the gas-filled cable were given by C. J. Beaver and E. L. Davey in a paper read before the Institution of Electrical Engineers in April, 1943 (*I.E.E. Journal*, Vol. 91, Pt. 2, No. 19). Its conductors are screened with metallized papers and insulated with pre-impregnated paper strips applied in air and screened overall with metal. A pressure-retaining sheath is reinforced mechanically with metallic tapes and a second sheath or further serving is applied overall. After installation the interior of the pressure-retaining sheath is charged with dry nitrogen and sealed.

The basis of the design is that no ionization occurs up to 100 deg. C. conductor tempera-

ture at less than twice the operating voltage. Ratio of gas space to oil space is such that gas density at conductor surface is approximately constant over the range of service temperature, thus imposing a minimum duty on the reinforced sheath. The cable can be run vertically for any height without drainage of the compound. Suppression of ionization is through gas pressure and space thickness. Paper thickness is graded, being thinnest near the conductor where a high ionization stress is obtained. A small length of gas-filled cable has been in service for nine years.

The compression cable, a 132-kV installation of which was described in the *Electrical Review* of May 25th, 1945, employs a normal mass-impregnated cable subjected to mechanical pressure of gas acting through an impermeable-diaphragm lead sheath, was first used in a pipe-line design in commercial service at 66 kV in 1932 and has ever since retained its gas pressure of 200 lb per sq in., although severely tested during air attacks on London. It is now paralleled by a three-core self-contained design, each 0·15 sq in. conductor being insulated with 0·285 in. thickness of paper and lead sheathed (S.L.) and subject to a maximum working stress of 80 kV per cm.

Sample lengths of the 0·4 sq in. 132-kV cable used in the grid system since September, 1944, capable of carrying 400 A and having a maximum stress of 100 kV per cm, have been impulse-tested at the National Physical Laboratory; results were limited only by flash-over on the outer surface of the porcelain, but a figure of 790 kV, corresponding to a maximum stress of over 1,000 kV per cm, was obtained. Experimental lengths for 264 kV operation have also been made.

Serving Housing Estates

Ministry of Health Circular

LAST week, in a report relating to a meeting of the Luton Town Council, reference was made to a circular issued by the Ministry of Health regarding, *inter alia*, supplies of gas and electricity to housing estates. We have now obtained a copy of the circular (112/46) and reproduce the gist of the relevant paragraphs.

The Minister of Health has had under consideration, in consultation with the Minister of Fuel and Power, the arrangements for supplying gas and electricity to housing estates. The decision of the Government to nationalize the gas and electricity industries involves the responsibility of ensuring that no steps are taken which will prejudice the future of these industries pending the decision of Parliament. In most cases the proposals put forward by local authorities for serving housing estates envisage the availability of both gas and electricity; there are, however, a number of cases in which local authorities propose to serve the houses with gas or electricity only.

The Minister of Health is satisfied that, unless the gas or electricity undertaking in the district is not in a position to give a supply to the housing estate, or the cost to the consumer of one or other of these fuels is too high for the normal type of tenant, a decision to serve a housing estate with only one of the fuels, to the complete exclusion of the other, is prejudicial to the co-ordinated development of both industries and deprives the consumer of the freedom of choice to which he should be entitled. Local authorities are therefore requested to arrange that each estate is served with both gas and electricity where the respective undertakings are prepared to do this and the cost is likely to be within the tenants' means. The Minister is prepared to leave to the discretion of the local authority the proportion of houses to be provided with either gas or electricity or both, provided that both the gas and electricity undertakings are consulted before the decision is made.

Supplementing Solid-Fuel Appliances

On account of the shortage of solid-fuel burning appliances, the Ministry, in an enclosure with the circular, asks local authorities to make provision in new houses for only one appliance of this type. If it is proposed to install a gas or electric cooker use should not be made of a solid fuel cooker.

If the authority has decided to use the available fuel appliance in the living room, other provision will have to be made for heating parlours, bedrooms or other rooms such as dining rooms. As a rule heat is required in such rooms only occasionally. One way of overcoming the shortage of solid-fuel appliances is to eliminate the chimney flue and provide gas or electric fires, at the same time providing alternative means for ensuring air changes. It is stated that substantial numbers of gas and electric fires are being made, although it may not always be possible readily to secure particular types or makes.

Local authorities are asked to make sure that when issuing priority certificates requirements for solid-fuel appliances are based on one per house except in mining areas and rural areas where electricity or gas are not available, when two solid-fuel appliances may be ordered for each house.

NEW BOOKS

Revised Editions of Electrical Engineering Handbooks

Electric Power Engineers' Handbook. By W. S. Ibbetson. Pp. 295; figs. 126; index. E. & F. N. Spon, Ltd., 57, Haymarket, London, S.W.1. Price 15s.

This second edition of the book which was first published in 1939 includes further information relating to installations, power factor, maintenance and testing. The subject is introduced with notes on practical units, Ohm's Law, magnetic circuits, and power measurements, and describes the principles of dynamos, alternators, d.c. and a.c. motors, transformers, their operation and control. The author also deals with boosters, balancers, motor-generator sets, rotary convertors, metal and electronic rectifiers and other apparatus. Notes on the care of plant, the faults most likely to be experienced in practice, and methods of testing are included, together with six or seven pages of mechanical engineering hints of use to plant engineers.

The chapter dealing with modern industrial electrical distribution and installation is well named, as it includes regulations applicable to earthing, single-pole fusing, installation tests, h.r.c. fuses, power factor correction, overhead busbar systems, and fluorescent lighting; all matters of considerable interest these days.

A rather special feature of this book is the considerable amount of space which deals with the actual control and operation of electrical plant. This should prove of interest and assistance to all whose duties include such work. The publication is designed to appeal to the man who has to do the job rather than to the student, but the treatment is intended also to stimulate inquiry into causes. Rather more space might have been devoted to the principles and characteristics of induction motors, whilst many engineers would doubtless have appreciated a full description of the a.c. commutator motor. Many plant troubles originate in the control gear so that more practical notes on this subject would have been of interest, with details of the various types of protective gear at present employed.

However, the author has made quite a good job of a big subject, and has produced a very useful handbook, which will undoubtedly be popular with all persons interested in the installation and operation of electrical power plant.—J.L.W.

Electric Wiring, Theory and Practice. By W. S. Ibbetson, B.Sc., A.M.I.E.E. Pp. 263; figs. 136. E. F. & N. Spon. Price 10s.

This is a new version of the eighth edition (published in 1944) of a work that was first printed in 1909 and the third edition to be produced since 1939, which should be sufficient to qualify it as a standard handbook on its subject. In this impression the chief difference noticeable is that the elementary theory presented in the first four chapters has been revised and slightly extended.

The 1946 Supplement to the Eleventh Edition of the I.E.E. Wiring Regulations evidently became available after this book had gone to press. For example, in a reference to Regulation 304 it is stated that the Regulations do not prescribe a maximum allowable voltage drop on motor circuits, whereas the Supplement provides that the voltage at the terminals of motors under normal conditions of load shall be not less than 92·5 per cent of the declared. There should, however, be little difficulty in referring to the Supplement in the few cases (notably with regard to socket-outlets) in which important amendments have been made to the Regulations.—C.O.B.

Whittaker's Electrical Engineer's Pocket-book. Edited by R. E. Neale. 7th Edition. Pp. 938, including index; figs. 452. Sir Isaac Pitman & Sons, Ltd. Parker Street, Kingsway, London, W.C.2. Price 30s.

This seventh edition of a very well-known and comprehensive collection of practical information, having been delayed by enemy action and other war causes, has been largely re-written. But its scope remains broadly industrial-electrical, although the section on electro-chemistry and electro-metallurgy has been omitted.

The major chapters on the generation, transmission, distribution and control of electricity have been elaborated and there are fresh short chapters on earthing, applications of a.c. commutator motors and regulating sets, air conditioning, thermionics and photo-electricity. The purpose of this bulky "pocket" book is to present facts, rules and formulæ with sufficient explanation to help students to select information, combined with enough comment to guide practising engineers in applying data.—W.O.F.

Books Received

Les Radiations. By Charles Fabry. (Pp. 220; 25 figs.) Librairie Armand Colin, 103, Boulevard Saint-Michel, Paris, 5e.

This is a concise but comprehensive study by a well-known French physicist of the nature and effects of radiation and its applications, mainly in chemical analysis, photo-chemistry and biological and therapeutic treatment.

Electronics in Industry. By George M. Chute. Pp. 461; figs. and index. McGraw-Hill Publishing Co., Ltd., Aldwych House, London, W.C.2. Price 25s.

Heating and Ventilating for Architects and Builders. By R. K. Cornell, A.M.I.H.V.E. Paul Elek Publishers, Ltd., 37-38, Hatton Garden, E.C.1. Price 7s. 6d.

Spanish Foreign Trade

Decrease in 1944 Electrical Imports

RETURNS of foreign trade recently issued by the Spanish Government show that between 1943 and 1944 there was a decline of about 25 per cent in the imports of electrical machinery and apparatus. From the table it will be seen that the only noteworthy exceptions to the decline were a few sizes of power plant and heating apparatus. There were heavy decreases in most classes of power plant, a 50 per cent drop in lamp imports and sharp falls in telegraph and telephone apparatus and lamps. The industrial position, which for many months was badly affected by drought and consequent shortage of hydro-electric power, has improved appreciably as a result of widespread rains. There is a good demand for British goods but its satisfaction is dependent upon a sufficient local supply of sterling to pay for the goods and the capacity of the British exporter to give the desired deliveries.

The values of imports are given in gold pesetas (45 pestas £1, but there is a surcharge for Customs purposes to make up for the depreciation of the paper peseta).

Class of Goods	1944 Pesetas (000)	Inc. or dec. on 1943 Pesetas (000)
Dynamos, motors, fans, alternators, transformers, starters, rheostats and parts up to 5 kg.	667	− 799
From Germany	361	− 741
„ Switzerland	151	− 23
„ Great Britain	90	+ 40
„ United States	13	− 31
„ Italy	1	− 42
Ditto from 5 to 25 kg.	978	− 162
From Germany	233	+ 57
„ Switzerland	319	− 122
„ Sweden	117	+ 73
„ United States	32	+ 20
Ditto from 25 to 100 kg.	1,217	− 580
From Germany	488	− 407
„ Switzerland	608	+ 69
„ Great Britain	12	+ 6
„ United States	2	− 2
„ Sweden	27	− 19
Ditto from 100 to 500 kg.	1,726	+ 233
From Germany	460	− 257
„ Switzerland	1,112	+ 542
„ Great Britain	15	+ 7
„ United States	1	− 58
„ Sweden	53	− 7
Ditto from 500 to 1,000 kg.	657	+ 165
From Germany	254	+ 50
„ Switzerland	298	+ 101
„ Sweden	67	+ 20
Ditto from 1,000 to 3,000 kg.	761	− 472
From Germany	107	− 477
„ Switzerland	592	+ 33
„ Sweden	50	+ 26
„ Great Britain	2	− 12
Ditto from 3,000 to 5,000 kg.	967	+ 91
From Germany	20	− 53
„ Switzerland	925	+ 122
Ditto over 5,000 kg.	3,614	+ 363
From Germany	1,446	− 451
„ Switzerland	1,315	*
„ Sweden	795	*
Generating sets and rotary convertors up to 1,000 kg.	724	+ 350
From Germany	382	+ 241
„ Sweden	264	+ 185
„ Switzerland	77	− 75
Ditto from 1,000 to 5,000 kg.	111	+ 30
From Germany	—	− 12
„ Sweden	22	+ 22
„ Switzerland	90	+ 46
Ditto over 5,000 kg.	300	+ 113
From Switzerland	300	+ 200
Dry batteries and parts	135	− 76
From Germany	135	− 76

* Exact increase not recorded

Class of Goods	1944 Pesetas (000)	Inc. or dec. on 1943 Pesetas (000)
Accumulators	104	− 23
From Germany	22	− 32
„ Sweden	75	+ 19
Electrical meters, voltmeters, ammeters and electro-medical apparatus	2,022	− 2,372
From Germany	539	− 831
„ Switzerland	613	− 517
„ Sweden	224	− 2
Switchboards	396	+ 224
From Germany	99	+ 57
„ Switzerland	272	+ 193
Heaters, cookers, hotplates, etc.	135	− 371
From Germany	65	− 288
„ Switzerland	52	+ 11
Lamps, complete	298	− 383
From Germany	257	− 280
„ Great Britain	6	+ 4
Mercury-vapour lamps	203	− 219
From Germany	100	− 207
„ United States	3	+ 2
Cables over 1 cm. diam.	286	− 94
From Germany	126	− 29
„ Great Britain	158	− 50
Cables not exceeding 1 cm. diam.	31	− 79
From Germany	14	− 21
„ Great Britain	12	− 47
„ Sweden	3	− 8
Insulated wire less than 0·5 mm.	41	—
From Germany	27	− 13
„ United States	8	+ 8
„ Switzerland	6	+ 6
Telegraph and telephone apparatus	2,577	− 965
From Germany	1,921	− 155
„ United States	56	+ 6
„ Great Britain	3	− 9
„ Sweden	205	− 400
„ Switzerland	122	+ 83
Radio valves	1,039	− 90
From Germany	654	− 118
„ United States	22	+ 19
„ Hungary	319	+ 122
Switches, circuit breakers, lampholders, etc., up to 1 kg.	270	− 314
From Germany	181	− 237
„ United States	7	+ 1
„ Great Britain	4	+ 3
„ Switzerland	56	− 69
Ditto, 1-100 kg.	866	− 714
From Germany	386	− 317
„ Switzerland	348	− 362
„ Sweden	75	+ 32
Ditto, 100 kg. and over	1,146	+ 6
From Germany	237	− 413
„ Switzerland	675	+ 283

ELECTRICITY SUPPLY

Result of Swindon Questionnaire. New 33-kV Scheme for York.

Birkenhead.—UNDERTAKING'S JUBILEE.—The Electricity Committee reports that the jubilee of the undertaking occurs in September, but recommends postponement of a formal celebration until the fuel situation has improved.

FRAUD-PROOF METERS.—Consideration is to be given by the Committee to the provision of fraud-proof meters when orders are next placed. A report is to be obtained as to the availability and supply of these types.

Birmingham.—COAL POSITION.—The Electricity Committee reports that despite every effort, the rate of fuel restocking has been far from satisfactory and the present position cannot but cause grave concern as to the situation which will arise next winter.

Bolton.—LOAN.—The Electricity Committee has obtained sanction to borrow £127,275 in connection with the 33-kV transmission scheme.

ELECTRICITY FOR ESTATE.—An electricity supply is to be provided to the Lever Edge Lane estate at a cost of £4,680.

Brighton.—SUPPLY TO HOUSES.—The Electricity Committee is to erect a substation and extend the mains at a cost of £4,726 to provide a supply to 158 houses at Woodingdean.

Chasetown.—REDUCED CHARGES FOR BURNTWOOD.—The Chasetown & District Electricity Co., Ltd., is to reduce electricity charges at Burntwood as follows: Quarterly meter supplies, from 6d. to 5½d. per kWh; prepayment meter supplies from 7d. to 6½d. Meter rents are to be discontinued. Burntwood Council has decided to send a letter to the Electricity Company stating that it is still not satisfied, one point being that the minimum charge for domestic rate is 15s., whereas in neighbouring districts it is 10s.

Chesterfield.—POWER STATION EXTENSIONS.—The Electricity Committee has appointed Wilcockson & Cutts, architects, to prepare plans for power station extensions.

Lichfield.—REVISION OF TERMS.—At a meeting of the Electricity Committee it was reported that the farmers concerned had now agreed to terms submitted in 1943 for the provision of a supply to three farms. In view of increased costs the Committee is to ask them to agree to revised terms.

SUPPLY EXTENSIONS.—The Committee is to provide a supply to Burntwood, Farewell and Chorley at a cost of £5,500, and at a cost of £2,050 to a new pumping station of the South Staffs Waterworks Co. at Nethertown.

Lincolnshire.—CHEAPER RURAL ELECTRICITY.—The North Lincolnshire and Howdenshire Electricity Co., Ltd., has informed consumers in the 800 sq. mile area served by the company that the standard rate for electricity is to be reduced from 7d. to 5½d. per kWh. A new tariff for farms in isolated places is also to be introduced, as part of the company's five-year plan of rural electrification.

Liverpool.—LOAN.—The Electric Power & Lighting Committee is applying for powers to borrow £84,902 for the purchase from the Ministry of Supply and the Ministry of Aircraft Production of the 33-kV cables laid to supply three war factories on the East Lancashire Road. The Committee is also to purchase from the Ministry of Supply for £44,809, plant and switchgear installed to supply these factories.

Rawtenstall.—EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £6,771 for the provision of a feeder cable in connection with the supply to Bacup and is seeking permission to borrow £17,362 for a substation and switchgear for supplies to various mills and workshops, a substation and extensions for the supply to the Hall Carr estate, and mains and services.

St. Pancras.—NEW SUBSTATIONS.—The Electricity Committee is to erect substations at Highgate Road (£5,920), University College (£2,780) and Rochester Place (£4,925).

Shipley.—PRIVATE GENERATION PROPOSAL.—Approached by the Shipley Picture House Co., Ltd., for a site adjoining the Glenroyal cinema for the erection of a building to house a Diesel engine unit to generate electricity for the cinema, the Highways Committee recommended the leasing of land for the purpose. At a meeting of the Electricity Committee, however, after the electrical engineer had reported on the existing charges for the supply to the cinema which the Committee considered reasonable in all the circumstances, it was decided that it would not be in the best interest of the Council to lease the site for such purpose and it was suggested that further consideration should be given to the matter.

South Shields.—SUPPLY TO TRADING ESTATE.—The Town Council is to supply electricity to the Bede trading estate at a cost of £7,180.

S.W. & S. Area.—CONSUMERS PAY PROMPTLY.—Out of a total revenue of £3,000,000 the bad debts of the Shropshire, Worcestershire & Staffordshire Electric Power Co. were less than £350 last year.

Stoke Newington.—APPLIANCE REPAIRS.—The Electricity Committee has asked the electrical engineer to submit proposals for the organization of a department to carry out repairs to consumers' domestic appliances.

Swindon.—PREFERENCE FOR ELECTRICITY.—In view of a two-to-one preference for electricity expressed by housewives in a questionnaire, the Town Council is to install 146 electric cookers and wash boilers, and 74 gas cookers and wash boilers, in the 100 permanent and 120 temporary houses now being built.

West Midlands.—INCREASE IN BORROWING POWERS.—A Bill has been published (Stationery Office, price 1d.) for confirming the West Midlands Joint Electricity Authority (Increase of Borrowing Powers) Order, 1946. The Order raises the maximum amount which may be borrowed by the Authority to £17,000,000.

Willesden.—SYSTEM IMPROVEMENTS.—Subject to sanction being received, it is proposed to carry out works at a cost of £61,000 as part of a general scheme for the reconstruction of the transmission and distribution system. In a report on the subject the electrical engineer

refers to the overloading of substations and says that to carry out the work properly it will be necessary first to redesign the transmission and distribution system of the whole borough.

York.—PROPOSED 33-kV SCHEME.—With the steady growth of load it is becoming increasingly difficult to transmit supplies at the existing voltages of 6·6 and 11 kV, especially in view of the limited accommodation for cables in the narrow streets of the city. In collaboration with the Central Electricity Board, which is carrying out alterations to meet anticipated growth in load, it has therefore been decided by the Council to take a supply at 33 kV at a new intake sub-station on the outskirts of the city, and interconnect this with the generating station by two 33-kV feeders through two 20 MVA 33/11-kV transformers. From the new intake sub-station two underground 33-kV feeders will be laid to the Acomb district (where a large housing estate is being developed) and two 10-MVA transformers will there feed into the 11-kV network. At a later date the 33-kV feeders will be extended to form a complete ring around the suburbs, where substations will be installed at strategic points to feed into the 11-kV network. Application is about to be made to the Electricity Commissioners for sanction to the scheme, necessitating the raising of a loan for £175,000.

TRANSPORT

Holland.—ELECTRIFICATION OF RAILWAYS.—The Netherlands Railways have announced that all their important lines should be electrified before May, 1951.—*Reuter.*

India.—RAILWAY ELECTRIFICATION.—As an instalment of the electrification programme of Mysore Province, the electrification of the Bangalore-Mysore section of the State railway system is planned, at an estimated cost of Rs. 9 million. This would minimize the import of coal, besides cutting down the cost of maintenance to an appreciable extent.

TROLLEY-BUSES.— A message from *Reuter's Trade Service* (Bombay) states that in Bangalore it is proposed to introduce a cheap and up-to-date electric trolley-bus service to serve the needs of the city as well as cantonment areas. The scheme is estimated to involve a capital outlay of approximately Rs. 2 million.

Leeds.—LARGE DEFICIT.—A deficit of £74,563 is shown in the annual report of the City Council's transport system, compared with a deficit of £43,535 for the previous year. To meet this accumulated deficit of £118,099 it has been decided to use the entire balance of the renewals fund which stands at £109,520, leaving £8,579 debit balance to be carried forward. There was a decrease of over 10 million in the number of passengers carried during the year (222 million), but the report states that the decline in traffic has now been arrested.

London.—PROPOSED INCREASE IN FARES.—A public inquiry was held last week into proposals by the London Passenger Transport Board for increased fares on its railway and road services. Mr. Craig Henderson, K.C., for the Board, said it was recommended that 1½d. fares should be raised to 2d. and the limit extended to one and a half miles. On 2d. fares for over one and a half miles and all 3d. and 4d. fares an increase of 1d. was recommended, with 1d. per additional mile for fares over seven miles and proportionate increases for rail fares over 1s. 2d. In a full year these increases and consequential adjustments would amount to £5,569,000. At existing rates the net revenue for 1947 was likely to show a deficit and the Board would have to call on the pool for a sum of the order of £5,750,000.

Mr. L. C. Hawkins, comptroller of the Board, in the course of his evidence, referred to the works programme. He said the Central London line extension from Liverpool Street to Stratford would open on December 1st, 1946, that to Loughton on September, 1st, 1947, and that to Epping on November 1st, 1947. At the other end of the line they were expecting to project the service over the G.W.R. line from North Acton to Greenford on February 1st, 1947.

On the application of Mr. Leon McLaren, Counsel for the L.C.C., it was decided to adjourn the inquiry until July 15th. The deputy-clerk to the Hornchurch U.D.C., supporting the application, said he thought there would be many counter proposals by local authorities.

Sheffield.—JUBILEE CELEBRATIONS.—A post-war built tramcar, streamlined and with fluorescent lighting, designed by the Transport Department, and a horse-drawn tram were running last week in the city as part of the celebrations in connection with the jubilee of the Transport Department. During the week a decorated tramcar in the form of a huge birthday cake, lighted with 50 candles, has run on all routes.

South Shields.—TROLLEY-BUSES.—Sanction has been received by the Town Council to borrow £31,500 for the purchase of ten trolley buses and £6,000 for overhead equipment.

Wolverhampton.—NEW TROLLEY-BUSES.—The Town Council has approved a proposal of the Transport Committee to spend £200,000 on new trolley-buses.

TRADE MARKS

THE following applications have been made for trade marks. Objections may be entered within a month from July 3rd.

MOTORMIDGE. No. B639,402, Class 7. Electric motors (not for land vehicles) and dynamos.—Hoover, Ltd., Perivale, Greenford, Middlesex.

MAICO. No. 628,384, Class 9. Wireless, thermionic and telephone apparatus and instruments.—Medical Acoustic Instruments, Ltd., 2, Bentinck Street, London, W.1.

ARDITE. No. 639,943, Class 9. Welding electrodes and electric welding appliances.—Hard Metal Tools, Ltd., Fletchamstead Works, Fletchamstead Highway, Tile Hill Lane, Coventry.

HUSTLAVAC. No. 640,463, Class 9. Wireless apparatus, electric vacuum cleaners and irons.—Nash Electrical Co., Ltd., 82, Snow Hill, Birmingham, 4.

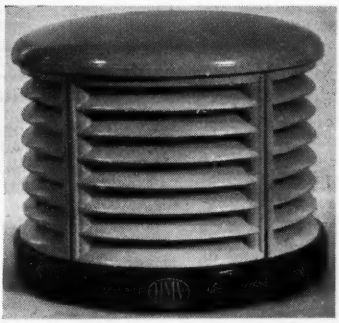
JAEPOL. No. 632,883, Class 11. Electrical apparatus and appliances for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, and water supply.—Jaepol Products, Ltd., Central House, 75, New Street, Birmingham, 2.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Household Appliances

APART from the heat-controlled iron already announced, the range of H.M.V. household appliances made by the GRAMOPHONE CO., LTD., Hayes, Middlesex, includes three kettles of attractively modern shapes. They are the 3-pint 1,250-W aluminium "Chelsea"; and the 3-pint 1,500-W "Bentinck" and 3-pint 1,000-W "Maddox," both made of pressed copper and double plated, first with nickel and then chromium. The last named is more jug-like in appearance and has moulded feet riveted to its base so that it may be boiled, in 12 minutes, on the tea table without damaging the polished surface.



Three-pint "H.M.V." tea table kettle and (right) "H.M.V.-Cavendish" room heater containing motor and fan

The range of radiant fires includes the "Bruton" and "Welbeck" with parabolic reflectors and single or double rod elements wound on refractory formers. The kidney-shaped "Belgrave" panel with spiral bar or porcelain former element is obtainable in different colours, while the "Cavendish" heater is a differently shaped successor of the pre-war "mushroom" convector, incorporating a motor and fan blowing air over the 2-kW element.

Television Receivers

Limited deliveries of two television receivers of post-war design, table and console models, have been commenced by PYE, LTD., Cambridge. The size of the black-on-white picture is 8 by 6 in. Interference is automatically suppressed in both sound and vision channels. Two exterior controls operate the on-off switch and vary brightness and volume. Four auxiliary controls are concealed beneath a shutter on the front of the cabinet for contrast, focus, frame hold and line hold. Seven pre-set controls at the back of the chassis for line linearity, line amplitude, vision sensitivity, sound sensitivity, frame linearity, frame amplitude and frame synch do not normally require adjustment after the set has been installed. A special Y-matched aerial has been developed for use with these receivers.

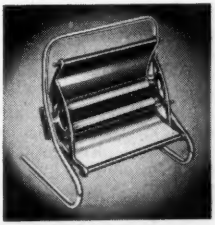
Trough Reflectors

To the fluorescent lighting fittings made by CROMPTON PARKINSON, LTD., Electra House, Victoria Embankment, London, W.C.2, there has been added a "Perspex" trough reflector for a 5 ft tube which diffuses some 20 per cent of the total light output upward. It is a single-piece white moulding, available in one- and two-lamp patterns.

Another new model is made in two main parts, the closed top channel of the trough carrying the control gear with a detachable reflector specially devised to facilitate installation and maintenance. Division of the weight between two parts enables the fitting to be fixed by one person without assistance. Wiring can be done before delivery, or after the channel has been erected but before the reflector is fitted; the open base of the channel saves time by avoiding any need to thread the wiring. The starter switch is removable from outside the body without detaching any part of the fitting. The removable reflector simplifies cleaning, at ground level, by substitution of a clean one for a dirty assembly and so on.

Balanced Tilting Fire

A radiant fire named the "Swallow" is announced by BESCOL (ELECTRIC), LTD., Parkfield Road, Saltley, Birmingham, 8. Only one type and size, 2 kW, is in production at present. The twin wound rod elements are removable without undoing screws, being merely pressed into positlon; protrusions on the terminals guide the elements into their housing. The heavy gauge brass reflector is chromium plated and, with its side castings, is sprung into a tubular steel

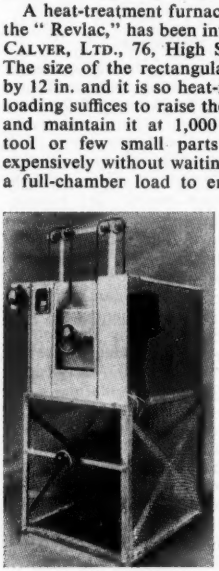


"Swallow" radiator

frame, balanced to remain at any tilt without adjusting screws or lock nuts. The switch, actuated from the side, and connection terminals are enclosed in a ventilated housing at the back of the reflector. The standard finish employed for the fire is stove enamelled cream for the tubular frame with pastel green reflector side castings.

Tool-treatment Furnace

A heat-treatment furnace for tools, known as the " Revlac," has been introduced by C. M. G. CALVER, LTD., 76, High Street, Bushey, Herts. The size of the rectangular chamber is 6 by 6 by 12 in. and it is so heat-insulated that 3·5 kW loading suffices to raise the temperature quickly and maintain it at 1,000 deg. Thus a single tool or few small parts can be treated inexpensively without waiting for the amassing of a full-chamber load to ensure economical use of the furnace.



Tool-treatment furnace with rectangular hot-chamber

Its nickel-chrome elements are supported in a way that permits expansion without strain and are enclosed for protection in a refractory sheath, which may be dismantled for cleaning and to render the elements accessible for renewal. They are energized at 8 V, derived from a built-in transformer connected to a.c. mains at 200/250 V. The low secondary voltage lengthens the element life and minimizes the risk of electric shock to furnace men. A thermocouple pyrometer is fitted and the door is equipped with a patented locking device, and is balanced by enclosed counterweights.

Silent Switches

Experience of thermostats has been utilized to develop silent switches for interrupting a.c. between silver contacts at low speed, the distance between them being limited to correspond to the minimum gap needed to prevent restriking of the arc after one cycle (1/50th second). That is the basic idea behind the " Mutac " silent switch which has recently been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.

Oscillograms indicate that the natural speed of separation by normal movement of the dolly very closely corresponds to the ideal speed necessary to interrupt the circuit with minimum damage to the contacts, which is proportional to the amount of energy dissipated. Movement of the dolly is checked without impact by a control spring bearing on a cam face. Silence of action is thus inherent in the design, not depending upon buffers or other damping mechanism. The contacts are set to a gap of

Silent action dolly switch

0·025 in. when open, to span which over 2,000 V would be necessary.

The live terminals, contact blade and plate and link are fixed to the sub-base, which is separated from the base by an intermediate insulating gasket forming a sealed joint. The sub-base and base are riveted together as a means of protection against moisture, dust, atmospheric conditions and interference with the gap settings.

The switch is designed for a normal load of 5 A, but it has been approved by both Ministries of Supply and Works for 8 A at 230 V. They have authorized the embodiment of the switch in the M.O.W. type kitchen control units for the kettle circuit. In exceptional cases they accept the switch for a load of 10 A and tests have shown that even at 10 A the useful life of the contacts is 100,000 operations. " Mutac " switches are available in both flush and surface types. The moulded plates for the flush type are ⅛ in. thick, the backs being slightly recessed and ribbed to add strength.

Screen Fire

A single-element screen fire in the form of a butterfly is being manufactured by A. C. PENNY, 43, Benson Road, Forest Hill, London, S.E.23. The rod element, which may be wound for 1,000 or 750 W as desired, is mounted vertically to form the body of the insect and the outspread wings are painted in a variety of colours and may be obtained in several different patterns.

Coloured screen fire

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

English Electric Co., Ltd.—It is proposed to increase the capital resources of the company by about £5,000,000 to meet the company's requirements in connection with the expansion of its own manufacturing and research facilities and the acquisition of the share capital of Marconi's Wireless Telegraph Co. Meetings are to be held on July 16th for the purpose of approving the issue of 1,500,000 new 3½ per cent cumulative preference shares by way of offer for sale to the public, and 1,179,577 existing ordinary shares as " rights " to ordinary stockholders in the proportion of one new share for every complete £2 of ordinary stock held. The price of issue is 57s. 6d. It is proposed to convert the present unissued balance of 364,156 6½ per cent cumulative preference shares into ordinary shares.

Johnson, Matthey & Co., Ltd.—In spite of shortages of materials, currency regulations and various controls the company's export sales are already double the rate of the pre-war figures. This was stated by the chairman, Mr. Hay W. P. Matthey, at the annual meeting. He added that as refiners of various raw materials, and manufacturers of a range of components prepared from them, which were employed in almost every industry, they fully acknowledged their responsibilities and were doing everything within their power to accelerate their production, without which it would be difficult for many other industries to develop or even to exist.

A. C. Cossor, Ltd., were to hold a meeting yesterday (Thursday) for the purpose of creating 500,000 new 5s. ordinary shares of which 400,000 are to be offered at 33s. 6d. each to existing ordinary shareholders in the ratio of one in five. Partly out of the proceeds of the issue and partly from existing resources the company proposes to carry out a programme of expansion and development. This includes the transfer of the valve and tube business to a new subsidiary, Electronic Tubes, Ltd., in collaboration with Sylvania Electric Products Inc., one of the largest valve manufacturers in the United States. A. C. Cossor's manufacturing facilities for domestic radio, television and scientific instruments are to be expanded. A subsidiary, Cossor Radar, Ltd., has been formed for the production of all forms of radar, including marine and air navigation equipment. A new factory is to be equipped at Aldermaston for use by another subsidiary, the Sterling Cable Co., Ltd.

Thomas Bolton & Sons, Ltd., report a trading profit for the year to March 31st last of £112,575, as compared with £298,568 for the previous year, and a net profit of £41,746 (against £217,383). Income tax requires £21,150, and it is proposed to pay a final ordinary dividend of 5 per cent, making 7½ per cent for the year (against 10 per cent). The balance carried forward is £68,699.

In his statement issued with the directors' report, Mr. P. V. Hunter (chairman) says that a year ago he reported a decline in the demand for the company's products for war purposes, without any sufficiently compensating establishment of peacetime conditions. These difficulties have persisted to an even greater degree throughout the year under review, with the result that the trading profit has been severely affected; there has been no benefit this year of an E.P.T. repayment, whereas last year £80,000 was brought in. Every effort has been made to re-establish the company on a satisfactory peacetime basis; export business has been expanded, the figures for the year being almost four times those of the preceding twelve months. Regarding the future the situation is more encouraging, the order book being in a satisfactory condition, but the capacity for low production cost of normal peacetime goods leaves much to be desired in certain departments. Plant replacements and expansions are being undertaken, and Habs Hall, near the Froghall Works, has been acquired to serve as a hostel for technical trainees and junior technicians.

Walsall Conduits, Ltd.—As already reported the accounts for 1945 show a net profit, before tax, of £127,722, compared with £194,999 for the preceding year. Tax provision (less £19,805 E.P.T. repayable for the year, including overprovision for the previous years written back) takes £54,443 (£120,702), and general reserve receives £20,000 (same). The ordinary dividend for the year is maintained at 55 per cent and £43,875 (£41,250) is carried forward.

The Revo Electric Co., Ltd., has announced a final ordinary dividend of 10 per cent (same) with a bonus increased from 2½ to 5 per cent, making 20 per cent (17½ per cent) for the year ended March 31st last. The net profit after tax was £77,220 (£70,121).

McMichael Radio, Ltd.—After providing £4,950 (£21,279) for tax the net profit for 1945 was £54,695 (£28,818). It is proposed to pay a further two and a quarter years' dividend on the 8 per cent preferred ordinary shares, bringing the dividend up to December 31st last.

Lancashire Electric Power Co.—The Electricity Commissioners have submitted to the Minister of Fuel and Power for confirmation a Special Order made by them upon the application of the company for the purpose of increasing the company's authorized share capital and borrowing powers. Any objections to the Order must be sent to the Assistant Secretary, Ministry of Fuel and Power, 7, Millbank, S.W.1, not later than July 23rd, with copies to Rees & Freres, Parliamentary Agents, 9, Victoria Street, S.W.1. Copies of the Order (1s each) may be obtained from the company or the Parliamentary agents.

Derbyshire & Nottinghamshire Electric Power Co.—A Special Order for increasing the company's authorized share capital and borrowing powers has been submitted to the Minister of Fuel and Power by the Electricity Commissioners. Any objections must be sent to the Assistant Secretary to the Ministry, as above, not later than July 19th, with a copy to John Kennedy & Co., Parliamentary Agents, 25,

Abingdon Street, S.W.1. Copies of the Order, price 2s each, may be obtained from the company at 66, Queen Street, London, E.C.4, and 1, Derby Road, Ilkeston, or from the Parliamentary agents.

The Palestine Electric Corporation, Ltd., in a preliminary statement, reports an increase in net sales from £119,129 in 1944 (after providing for tax and £30,000 for deferred maintenance) to £206,383 last year (after tax and £50,000 for deferred maintenance). The dividend on the ordinary and "A" ordinary shares is being raised from 5 to 6 per cent tax free and £75,000 (nil) is allocated to general reserve.

Brazilian Traction Light & Power Co., Ltd.—The net revenue for 1945 was U.S. $22,212,516 against $21,934,218 for 1944. At the annual meeting in Toronto the chairman (Colonel W. Gow) said that the present heavy construction programme was necessitated chiefly by the growth in demand, which had been unchecked throughout the war, together with the need for restoring the company's power reserves. Regarding rumours of the likelihood of expropriation by the Government of the company's properties, the chairman said that there was no suggestion by the Government to this effect.

The Victoria Falls & Transvaal Power Co., Ltd., has recommended a final ordinary dividend of 15 per cent (against 11 per cent), making 19 per cent (15 per cent) for the year. The directors state that the net profit will not differ materially from last year's, although the accounts are not yet completed.

Bagdad Light & Power Co., Ltd.—The accounts for 1944 show a total revenue of £248,117 (£215,815) and a net profit of £17,246 (£12,892). The ordinary dividend is 5 per cent tax free (against 5 per cent less tax) and £6,305 (£7,810) is carried forward.

Bridgwater & District Electric Supply & Traction Co., Ltd.—A meeting is to be held on July 25th to authorize an increase in capital to £220,000 by the creation of 100,000 second preference shares. It is proposed to cancel 10,000 of the 105,000 £1 7 per cent cumulative preference shares which have not been issued.

J. Stone & Co., Ltd., report a net profit for 1945 of £228,155 (against £224,114 for 1944) after crediting £28,000 (nil) E.P.T. recovery. The ordinary dividend is 25 per cent (same). Output was adversely affected by cancellations of war contracts but large orders since received should result in the works being fully employed for the next twelve months.

The Ebonite Container Co., Ltd., has declared a final dividend of 5 per cent and a bonus of 7 per cent, making 17 per cent for the year (unchanged).

West of England Electric Investments, Ltd., propose to pay a dividend of 8 per cent, against 7 per cent last year.

The Electric Construction Co., Ltd., is maintaining its ordinary dividend at 12½ per cent.

The John Thompson Engineering Co., Ltd., is paying a final dividend of 12½ per cent and a bonus of 5 per cent, again making 22½ per cent for the year.

International Combustion, Ltd., is raising its interim dividend from 5 to 10 per cent.

New Companies

S. H. Collett Manufacturing Co., Ltd.—Private company. Registered June 28th. Capital, £15,000. Objects: To acquire the business of a manufacturer of, and dealer in, electrical fuses, terminals and electrical accessories, now carried on by S. H. Collett at 341, Goswell Road, E.C.1. S. H. Collett, Shirley House, 13, Avondale Avenue, N.12, is the first director. Registered office: 341, Goswell Road, E.C.

Edinburgh Electrical Industries, Ltd.—Private company. Registered in Edinburgh June 12th. Capital, £5,000. Objects: To carry on the business of electricians, electrical engineers, etc. Subscribers: D. G. Jack, and D. W. Mitchell, both of 21, Abercromby Place, Edinburgh. Secretary: D. G. Jack. Registered office: 21, Abercromby Place, Edinburgh.

Southampton Electrix, Ltd.—Private company. Registered June 5th. Capital, £7,500. Objects: To acquire the business of a wholesale electrical dealer carried on by T. W. Gullett as "Electrix" at 126, Macnaghten Road, Southampton. T. W. Gullett, 126, Macnaghten Road, Southampton, is permanent director. Registered office: 126, Macnaghten Road, Southampton.

Stott & Merryweather, Ltd.—Private company. Registered June 19th. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical, wireless and telephone apparatus and supplies of all kinds, etc. Permanent directors: H. Stott, 2, Kirby Avenue, Swinton, Lancs., and H. Merryweather, "Rosmer," Denesway, The Avenue, Sale, Ches. Registered office: 545a, Liverpool Road, Irlam, Lancs.

Petna Electric, Ltd.—Private company. Registered June 21. Capital, £100. Objects: To carry on the business of manufacturers of, and repairers of, and dealers in, dynamos and motors, armatures, etc. Mrs. B. Donner, 172, Ellesmere Road, N.W.10, is the first director. Registered office: 172, Ellesmere Road, Park Avenue, N.W.10.

Brocklehurst & Ginns, Ltd.—Private company. Registered June 21. Capital, £2,500. Objects: To acquire the business of an electrical engineer and contractor carried on by W. Geary at Barnwell and Hinckley, Leics. Directors: S. G. Brocklehurst, 158, Wolvey Road, Burbage, and D. J. Ginns, 3, Springfield Road, Hinckley, Leics. Registered office: 11, Stockwell Road, Hinckley.

Liquidations

Radio Services (Bristol), Ltd.—Meetings of members and creditors are to be held on August 1st at the offices of E. T. Collins & Son, 28, Baldwin Street, Bristol, 1, to hear an account of the winding-up by the liquidator, Mr. A. C. Collins.

Bankruptcies

K. Badar, electrical equipment manufacturer, lately carrying on business at Westmoreland Road, Hendon.—Public examination to be proceeded with on August 13th at Bankruptcy Buildings, Carey Street, W.C.2.

STOCKS AND SHARES

ON Tuesday the Government withdrew the issue of 2½ per cent Savings Bonds which have been on tap since May 17th. The result was to bring in sellers of existing gilt-edged stocks. But the dullness which this caused amongst British Government securities had no effect upon the prices of industrials. Amongst features of the week, a further rise in Cable & Wireless stands out. Home Railways continue depressed in spite of the raising of fares. Southern preference at 115 and the preferred at 72 are both lower.

London Transport

London Passenger Transport stocks remained unmoved by the Board's appeal for higher fares, which are shown to be a manifest necessity if the system is to stand financially on its own feet. Under the wartime control agreements, the Board's revenue has been maintained only by heavy subsidies from the surpluses earned by the main lines. This state of affairs is held to be undesirable in peacetime, and with fares at their present level, the Board faces a prospective deficit of nearly a million pounds for the current year. At a price of 60, the Board's " C " stock offers a yield of 5 per cent.

Cossor Capital

Consent has been given by the Capital Issues Committee to an increase in the capital of A. C. Cossor. The intention, noted here last week, is to offer 400,000 5s. ordinary shares to existing shareholders on the basis of one new share at 33s. 6d. for every five held. The price of the old shares rose to 43s. 3d., but sellers came in, and it went back to 40s. 9d. At this level, rights to the issue are equivalent to about 1s. 6d. per old share. The annual report for the year ended last March is due in the early part of next month. For 1944-45 the distribution was 12½ per cent tax free. This year's interim dividend was maintained at 3 per cent tax free. Commercial radar is mentioned among the items for the development of which the new capital is required. Some falling off in trading is forecast until the development programme is in full operation.

Price Fluctuations

Electrical Distribution of Yorkshire at 42s. 6d. and Yorkshire Electrics at 43s., are both 6d. higher. Scottish Power are similarly better at 39s. Fluctuations in the equipment and manufacturing section are upwards on balance. Falk Stadelmann have risen to 47s. 6d., Mather & Platt to 58s. 9d., and Murex to £5. Associated Electrical 8 per cent preference moved up to 44s. 3d., General Electric 6½ per cent to 36s. 6d. Ericsson Telephones rallied to 58s., after their last week's decline. Tube Investments are ⅛ up at 6¼. Thorn Electrics strengthened to 34s. On the minus side, Siemens at 38s., Ever Ready, 50s., and Automatic Telephones, 76s. 6d., show small losses. A few thousand Strand Electrics have been on offer at 13s. 6d.

Revo Electric

Revo Electric has paid for each of the last four years, 17½ per cent dividend on its ordinary shares, this including a bonus of 2½ per cent. The interim dividend declared last November is now supplemented by a further payment of 15 per cent, raising the dividend for the full year to 20 per cent. The net profit of £77,200 is £7,100 up. The issued capital is £367,500 in 10s. shares, the price of which, 56s. cum dividend, is practically the highest since the company was made public in 1936. At this price, on the increased dividend of 20 per cent, the yield comes to £3 12s. 6d. per cent on the money. On the previously paid 17½ per cent, the present quotation allowed a yield of £3 2s. 6d.

Company Results

Walsall Conduits full accounts showed that the decline in the trading profit from £195,000 to £128,000 was offset by smaller tax provision. After payment of the regular 55 per cent dividend, £20,000 is allotted to general reserves, and the carry-forward is rather higher than before at £106,000. At 60s., the 4s. shares yield £3 13s. 4d. per cent. The £1 shares of Christy Bros., seldom come into the market, but on the basis of about 86s. 3d. they provide a return of over 4 per cent on the dividend recently maintained at 17½ per cent. Gross profits, according to the preliminary figures accompanying the declaration, are a little below those of the previous year. International Combustion is increasing its interim dividend from 5 to 10 per cent, with the object of narrowing the margin between this and the final dividend, which last year was 27½ per cent, making 32½ per cent for the twelve months. Ward & Goldstone rose 3s. to 47s. on the excellent dividend and increased profits. Victoria Falls remain at 5¾, the dividend, making 19 per cent, having no effect.

Radio

A further advance in the profits of McMichael Radio during last year has enabled the company to bring up to date the interest on the preferred ordinary capital, which started the period with 4¾ years' arrears of dividend. The £1 shares are entitled to a cumulative 8 per cent dividend, and to a participation of 40 per cent in profits remaining after 8 per cent has been paid on the 5s. ordinary. The latter have been changing hands around 9s. 6d. The preferred stand at 32s., cum dividends amounting to 18 per cent gross. There has been a revival of interest in Ultra Electric (Holdings) 5s. shares at 11s. 6d., with the approach of the dividend date. Dividends of 10 per cent have been paid for each of the last three years, and fresh capital was raised last May.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

R. H. F. BOTT and Under Water Welders & Repairers, Ltd.—"Illumination devices for use under water." 23246. November 22nd, 1944. (578219.)

British Thomson-Houston Co., Ltd.—"Synthetic resinous reaction products of aldehydes and triazine derivatives." 12187/43. July 29th, 1942. (578196.) "Power reduction circuit for radio receivers." 1064/44. January 22nd, 1943. (578201.) "Electric valve translating apparatus and methods of operating the same." 14334/44. July 27th, 1943. (578246.) "Electric apparatus and method of applying an insulating covering thereto." 9135/43. June 9th, 1942. (578276.)

British Thomson-Houston Co., Ltd., and D. Gabor.—"Electron optical systems." 3510. March 3rd, 1943. (578273.)

British Thomson-Houston Co., Ltd., and J. G. Wellings.—"Chokes for single-phase a.c. circuits." 15555. August 15th, 1944. (578248.)

Commercial Secretaries, Ltd., and H. A. Tunstall.—"Electric cables." 997. January 23rd, 1942. (578298.)

Cooke & Ferguson, Ltd., and R. Drucker.—"Adaptor fittings for electric lampholders." 24212. December 4th, 1944. (578180.)

E. C. Cork.—"Transmission of electrical energy." Cognate applications 1390/41 and 9505/41. February 3rd, 1941. (578186.)

E. I. du Pont de Nemours & Co.—"Production of tapered artificial filaments." 7969/44. April 29th, 1943. (578238.)

Elektriska Svetsnings Aktiebolaget.—"Jaws of stone and similar crushers." 22465/44. November 13th, 1943. (578292.)

Ferranti, Ltd., and M. K. Taylor.—"Signal transmission systems." Cognate applications 8887/43 and 8304/44. June 3rd, 1943. (578274.)

General Electric Co., Ltd., and R. C. Chirnside.—"Manufacture of nickel-iron alloys." Cognate applications 9906/42 and 10737/42. July 16th, 1942. (578193.)

General Electric Co., Ltd., A. H. McKeag and P. W. Ranby.—"Luminescent materials." Cognate applications 8308/42, 11918/42 and 17405/42. June 17th, 1942. (578192.) Luminescent materials." 6991. May 3rd, 1943. (578195.) "Luminescent materials." 8309. June 17th, 1942. (578272.)

General Electric Co., Ltd., L. A. Thomas and A. H. Morser.—"Mounting of piezo-electric crystals." 20401. October 20th, 1944. (578290.)

C. R. L. Hall, E. Jones and Imperial Chemical Industries, Ltd.—"High-tension electric fuse-heads." 8904. June 29th, 1942. (578300.)

Hazeltine Corporation.—"High frequency signal generators." 9075/41. September 30th, 1940. (578151.)

Holophane, Ltd. (Holophane Co., Inc.).—"Lighting systems and lighting units for use therein." 25547. December 20th, 1944. (578184.)

J. Imber, and Aladdin Radio Patents, Ltd.—"Cores for electrical inductances." 18613. September 28th, 1944. (578218.)

P. W. Lew.—"Electric cautery instrument for use in nasal surgery." 7858. April 27th, 1944. (578166.)

P. E. Randall.—"Electric heaters for electroplating or other vats, tanks, and like vessels." 21100. December 16th, 1943. (578316.)

E. Schwarz.—"Thermo-electric devices." 8364. July 2nd, 1941. (578187.) "Thermo-electric devices." 8365. July 2nd, 1941. (578188.)

G. R. Shepherd (Westinghouse Electrical International Co.).—"Electric overload circuit-breakers." 3050. February 18th, 1944. (578231.)

Siemens Electric Lamps & Supplies, Ltd., and J. N. Aldington.—"Electric discharge lamps." 30501. November 21st, 1939. (578150.)

S. Smith & Sons (Motor Accessories), Ltd., and F. W. Meredith.—"Devices for detecting or measuring magnetic fields and particularly to magnetic compasses." 11367. August 13th, 1942. (578303.)

P. A. Sporing, C. P. Johnson and Telegraph Condenser Co., Ltd.—"Tubular containers for electrical condensers or other apparatus." 8681. May 8th, 1944. (578240.)

Standard Telephones & Cables, Ltd.—"Electrical devices for testing materials." 7989/44. June 4th, 1943. (578207.) "Method of making selenium elements." 8159/44. May 1st, 1943. (578208.) "Electron discharge apparatus." 4653/42. April 1st, 1941. (578269.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—"Electrical time-delay detonating circuits." 15387. November 28th, 1941. (578153.) "Radio direction finders." 10730. July 31st, 1942. (578301.) "Equipment utilizing radio electric waves for determining direction or location of an object." 8994. June 4th, 1943. (578275.)

Standard Telephones & Cables, Ltd. (International Telephone Development Co., Inc.).—"Tube arrangement for frequency doubling." 4744. April 10th, 1942. (578270.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Electron discharge devices employing secondary emission." 5820. April 30th, 1942. (578271.)

Standard Telephones & Cables, Ltd., and S. E. Buckley.—"Magnetic dust cores." 16407. August 29th, 1944. (578250.)

Standard Telephones & Cables, Ltd., and H. P. Williams.—"Radio guiding systems." 10791. July 31st, 1942. (578302.)

J. Stone & Co., Ltd., and L. R. Nixon.—A.c. voltage-responsive arrangements." 5145. March 20th, 1944. (578235.)

United Insulator Co., Ltd., P. A. Hammond.—"Electrical condensers." 10096. May 24th, 1944. (578171.)

Vickers-Armstrongs, Ltd., and A. W. Whistlecroft.—"Electric signalling or controlling devices." 7998. March 15th, 1938. (578149.)

G. M. Wright and C. S. Wright.—"Electrical signalling systems." 5739. March 28th, 1944. (578322.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Beckenham.—July 17th. Electricity Department. Meter testing instruments, steel shelving and wooden meter testing benches. (June 28th.)

Berwick-on-Tweed.—July 19th. Borough Council. Street lighting fittings. (See this issue.)

Bishop's Stortford. — July 15th. U.D.C. Electrical installations in 132 houses, Havers Lane. G. N. Drinkwater, clerk, Council House.

Burnley.—July 29th. Electricity Department. Four-core and twin 660-V cables. (See this issue.)

Colchester.—August 23rd. Water Supply Department. Three centrifugal pumps. (See this issue.)

Colwyn Bay.—July 20th. Electricity Department. Switchgear, transformer kiosks, transformer and overhead line. (June 28th.)

Cwmbran.—July 16th. Urban District Council. Underground cables. Oakfield Road housing site. F. E. Mills, electrical engineer, Council Offices.

Elland. — July 20th. U.D.C. Electrical installations in thirty permanent houses, Stainland site. Particulars from F. R. Birkhead, engineer and surveyor, Council Offices.

Manchester.—August 1st. Electricity Committee. 420-V switchgear at Stuart Street generating station. (See this issue.)

Sale.—July 24th. Town Council. Power and lighting installations in houses, Carrington Lane site. Borough electrical engineer, Town Hall.

Southampton.—August 27th. Town Council. Electrically driven pumping plant, together with transformer, rectifier equipment, d.c. motors, switchboard, starters, and other electrical equipment. (Deposit, £5). J. Hawksley, waterworks engineer, Civic Centre.

Southwark.—July 15th. Electricity Department. Wiring domestic premises. (July 5th.)

Orders Placed

Birkenhead.—Electricity Committee. Accepted for twelve months:—400-V contactors. —Sangamo Weston. Meters.—Aron; British Electric Meters; Chamberlain & Hookham; English Electric Co.; Ferranti; Landis & Gyr; Sangamo Weston; Smith Meters; Venner Time Switches. Paper-insulated cables.—Scottish Cables; Aberdare Cables; Britannic. Rubber-insulated cables.—Wm. Geipel; Hackbridge; Mersey Cable Works; Scottish Cables. V.i.r. lead-covered s.w.a. cable.—Hackbridge.

Bolton.—Electricity Committee. Accepted. 33-kV and auxiliary cables.—B.I. Callenders Cables.

Chesterfield.—Electricity Committee. Accepted. Meter testing equipment (£1,406).—H. J. Fuller & Sons.

Eccles. — Sewage Committee. Accepted. Electric pumping plant at sewage works (£2,551).—Pulsometer Engineering Co.

Huddersfield.—Electricity Department. Accepted. Transformers.—Metropolitan-Vickers Electrical Co. (four 300-kVA and three 750-kVA), English Electric Co. (two 300-kVA), Hackbridge Elec. Construction Co. (three 500-kVA), and Ferranti (two 300-kVA).

Hull.—Telephones Committee. Accepted. Table telephones (£5,941).—Automatic Telephone & Electric Co. Switchboards (£1,206). —Ericsson Telephones.

Housing Committee. Accepted. Electrical installation in 18 houses on the Endyke estate (£396).—Accumulator Contracting Co.

Liverpool.—Electric Power & Lighting Committee. Recommended. 500-A polyphase meter test set with test rack (£1,681).—Ferranti.

Middleton.—Town Council. Accepted. Electrical installations in 86 houses, Moorclose estate (£3,139).—Wade & Mills.

Newcastle (Staffs).—Town Council. Accepted. Electric lighting, heating and power installation in Farcroft Maternity Home (£1,200).—J. Bagguley & Son.

Southwark.—Electricity Committee. Accepted. Three switchboards (£1,387).—Cooke & Ferguson.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Adlington.—Houses (50), Four Acre and Fairview estate (£55,944); G. Moss & Sons, Ltd., St. Helens Road, Leigh, Lancs.

Alloa.—New building and plant for Harland Engineering Co. (£100,000); manager.

Andover.—Houses (60) on five sites for R.D.C.; F. Henshaw, architect, Westminster Bank Chambers.

Arundel.—Houses (38), Green Lane site (£47,326); W. Stirland, builder, Birdham, Chichester.

Ashton-under-Lyne.—Houses (44), Nook Lane and Kenworthy Avenue (£56,380); A. Deane, builder, 172, Stamford Road, Audenshaw, Manchester.

Aylesbury.—Houses (38), Council's housing estate, South Court; R. White, Council's architect, Ceely House, Church Street.

Barnes.—Temporary municipal offices, Hampton Square, Sheen Lane (£22,411); W. Few & Sons, Ltd., 17, Highbury Park, N.5.

Battle.—Houses (26), Church Lane, Salehurst, for R.D.C.; A. H. Neave, architect, 35, High Street.

Beaminster.—Houses (34), Old Fairfield housing site, Tunnel Road; R. Leigh, clerk to the council.

Benfleet.—Secondary school (£76,034); Essex county architect, Chelmsford.

Blackwell.—Bungalows (18), and twelve houses, Langwith Junction; architect and housing superintendent, 100, Chesterfield Road South, Mansfield.

Boscombe.—New Hippodrome (£150,000); J. Stanley Beard, architect, Baker Street, London.

Bournemouth.—Houses (48), Paddington Grove; Golton Bros. (Builders), Ltd.

Braughing.—Houses (30), Braughing and Aspenden (£38,103); G. Davies & Son, Ltd., builders, Broxbourne, Herts.

Brierley Hill.—Houses (39), Hulland site (£45,972); Batham & Beddell, Ltd., builders, 9, Moor Street.

Bute.—Houses (30), Arran, for the County Council; R. Rennie, architect, 20, Green Street, Saltcoats.

Caernarvon.—Permanent houses (100), Maes Incla estate; W. Rees Davies, borough engineer, Briggs' Chambers.

Cardiff.—Permanent houses (300), Rumney and Gabalfa; city surveyor, City Hall.

Chertsey.—Houses (50) for U.D.C.; engineer and surveyor, Council Offices.

Cowbridge.—Houses (50), Tylacoch, Llanharry, for R.D.C.; E. Loveluck, architect, 12, Dunraven Place, Bridgend.

Daventry.—Houses (52), Braunston Road (£62,449); Bosworth & Wakeford, Ltd., builders, New Street.

Deptford.—Flats, Crossfield estate (£43,689); M. J. Gleeson, Ltd.

Doncaster.—Houses (30), Briar Road, Armthorpe (£38,229) for R.D.C.; R. Worrall, builder, 1, Sidney Street, Swinton, Yorks.

Durham.—Additions to St. Mary's College (£168,000); E. V. Harris, architect, 39, West Eaton Place, Eaton Square, London, S.W.1.

Factory extensions (£65,000); Adams (Durham), Ltd. chocolate makers.

Houses (36), Shadforth, Cassop and Croxdale; J. Gray, housing architect, Byland Lodge.

Friern Barnet.—Flats (36), Alexandra Road (£43,658); McManus & Co., Ltd.

Glasgow.—Houses (64) for Corporation; city architect.

Hostel (33 dwellings), central heating, for Corporation housing department, Sannox Gardens; city architect.

Glossop.—Permanent houses (36), Sheffield Road site; George Faulds, borough surveyor, Municipal Buildings.

Goole.—Houses (38), and eight flats, Mount Pleasant housing site; J. H. Castle, borough engineer, Municipal Offices.

Great Yarmouth.—Extensions, transport depot and workshops (£23,000); F. R. Hipperson & Sons, Ltd., Trowse, Norwich.

Halesowen.—Houses (46) on three sites (£52,304); J. M. Tate & Son, Ltd., builders, Highfield Road, Cradley Heath.

Hammersmith.—Extensions to post-graduate medical school (£11,900); Bridge, Walker & Co., Ltd.

Hawick.—Houses (163) for Town Council; burgh surveyor.

Ipswich.—Maternity home, Beccles (£14,000); county architect, Burlington Road.

Keynsham.—Permanent houses (82), Broadlands estate; N. H. Darby, 1, The Centre, Weston-super-Mare.

Kilrenny and Anstruther (Fife).—Houses (26) for Town council; L. A. Rolland, quantity surveyor, 47, High Street, Leven, Fife.

Longridge.—Houses (30), St. Paul's site (£35,185); W. Livesey & Sons, builders, Nova Scotia Works, Blackburn.

Melton Mowbray.—Houses (154), Adfordby and Nottingham Road site; Culpin & Son, architects, 3, Southampton Place, W.C.1.

Newark.—Permanent houses (70), Winthorpe Road; J. H. Clarke, borough surveyor, Balderton Gate.

Newburn-on-Tyne.—Houses (244), twelve houses and shops, and twenty aged people's houses, Mount Pleasant; U.D.C. surveyor.

North Riding.—Primary schools, Ormesby and Whitby; county architect, County Hall, Northallerton.

Norwich.—Two primary schools, Tuckswood Lane and Horns Lane; city engineer.

Oldham.—Houses (44), Stoneleigh estate; A. Hoggins, Ltd., builders, 2a, St. John's Street, Werneth.

Portland.—Houses (54), Pound Piece, Weston Road; Crickmay & Sons, architects, 23, St. Thomas Street, Weymouth.

Portsmouth.—Houses (46), Paulsgrove estate; city architect, 1, Western Parade, Southsea.

Runcorn.—Permanent houses (30), Halton Road; A. B. Cunningham, surveyor, Town Hall, Heath Road.

St. Marylebone.—Flats, Barrow Hill Road (£86,404).—Demolition & Construction Co.

Scarborough.—Houses (22), Barrowcliff estate; J. Jaram & Sons, builders, 20a, Gladstone Street.

Shipley.—Factory extension, Manor Lane; Dean & Thompson, Ltd.

Southwark.—Flats (60), Queen's Row; Griggs & Son, Ltd.

Stockport.—Works and stores, Blenheim House, Hempshaw Lane; T. Davies & Son (Contractors), Ltd., builders, Croft Mill, Hempshaw Lane.

Uckfield.—Permanent houses (66), Crowborough, Danehill, Frant, Uckfield and Wadhurst; surveyor, Council Offices, Beacon Road, Crowborough, Sussex.

Wakefield.—Cinema, Peacock estate; Savoy Picture House (Huddersfield), Ltd.

Waltham Cross.—Houses (202), Princes Field estate, Upshire; R. H. A. Jones, architect, 109, Marsham Street, London, S.W.1.

Wellington (Salop).—Houses (44), Mannerley Lane site, Ketley; James Hickman & Son, Market Street.

Whittlesey.—Houses (26), Eastrea Road; W. Ruddle, Long Causeway Chambers, Peterborough.

Wortley.—Houses (60), on six sites for R.D.C.; J. Gregory, surveyor, Council Offices, Grenoside, Sheffield.

York.—Factories, Gale Lane, for Nourishment, Ltd., and Smith's Cereal Food, Ltd.; Needham & Thorpe, architects.

Houses (64), St. Helens estate, Dringhouses; F. Shepherd & Son, Ltd.